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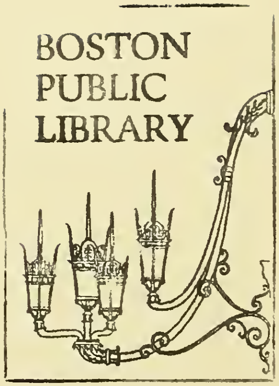

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DRAFT PROJECT IMPACT REPORT
Boston College Lower Campus Housing and Dining Facilities Project

Submitted to:
Boston Redevelopment Authority

Submitted by:
Boston College

April 8, 1992

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EXECUTIVE SUMMARY

PROPOSED PROJECT:	Boston College Lower Campus Housing and Dining Facilities Project
PROJECT LOCATION:	Boston College, Lower Campus 140 Commonwealth Avenue Boston, MA 02167
APPLICANT:	Trustees of Boston College

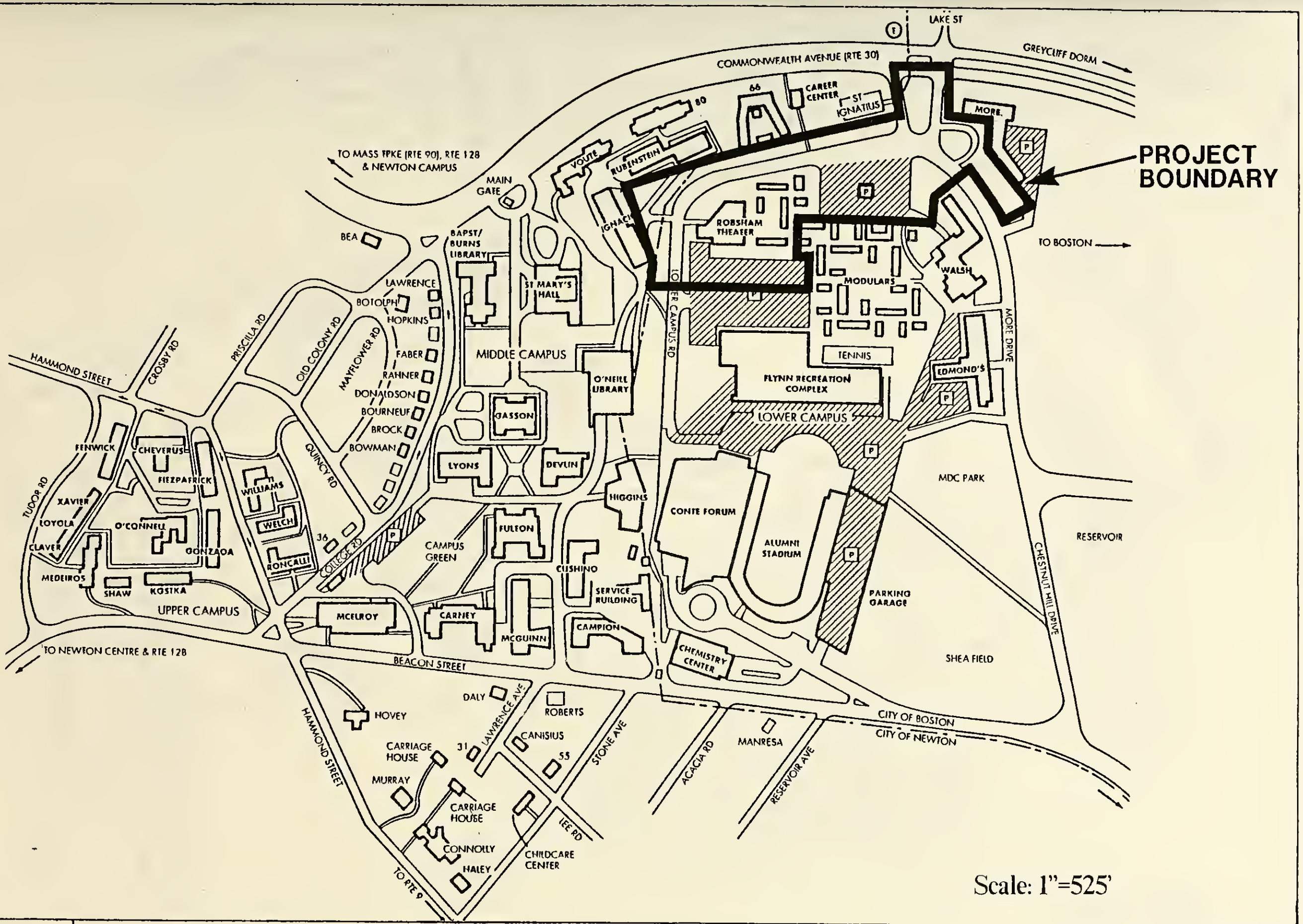
APPLICABLE REQUIREMENTS

This Draft Project Impact Report is being submitted in accordance with a Scoping Determination issued by the Boston Redevelopment Authority pursuant to Section 31-5 of the Boston Zoning Code (the Code). Appendix A contains the Scoping Determination. The Scoping Determination requests information in connection with Development Review pursuant to Article 31 of the Code and Certification of Consistency with Approved Institutional Master Plan, pursuant to Article 51 of the Code. The documentation in this Draft Project Impact Report responds to the requirements of the Scoping Determination.

PROJECT DESCRIPTION

Boston College is a not-for-profit educational institution located partially in the Brighton neighborhood of Boston and partially in Newton. Boston College has an enrollment of 14,000 students, of which 8,500 are undergraduate students and 5,500 are graduate students. This enrollment has been constant since 1976 when the College decided to "cap" undergraduate enrollment at 8,500. The College employs approximately 3,000 people.

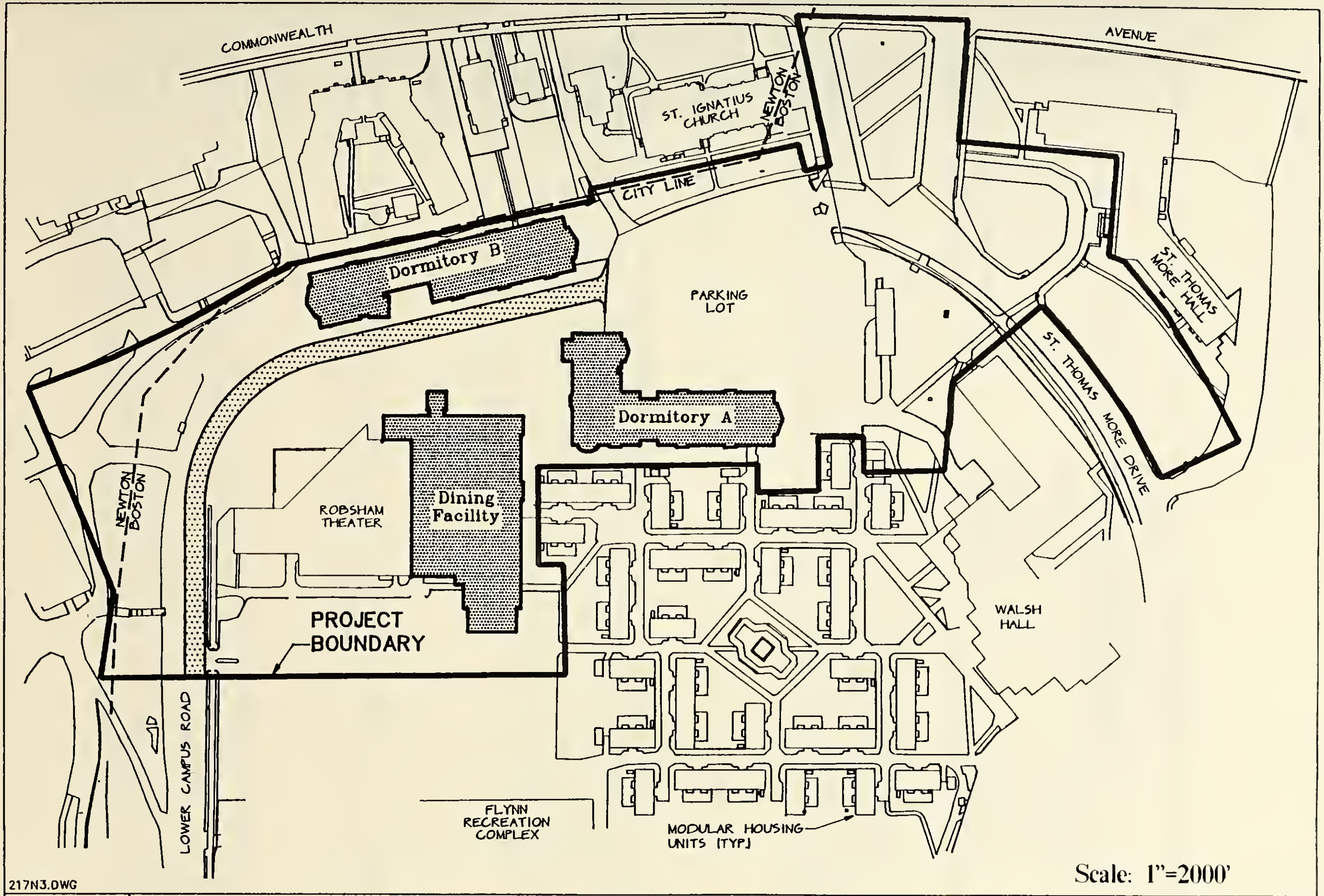
The Lower Campus Housing and Dining Facilities Project (the Project) consists of two new undergraduate dormitory buildings and a new dining facility, totaling approximately 276,000 gross square feet of new space. The two proposed dormitory buildings will contain a total of approximately 225,000 square feet of gross floor area and will house approximately 734 new student beds. The net increase in student beds will be 614 due to the demolition of some modular housing. The height of the dormitory buildings will be 6 stories. The dining facility will be located in a separate building of approximately 51,000 gross square feet and will seat 800 students and have 305 function seats. The dining facility will be 2 stories in height. Table S-1 summarizes the characteristics of the Project, and Figures S-1 and S-2 show the project area and the location of the proposed new buildings.



PROJECT AREA

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure S-1



PROPOSED PROJECT

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure S-2

TABLE S-1

LOWER CAMPUS HOUSING AND DINING FACILITIES PROJECT

Dormitory A	Dormitory B	Dining Facility
115,000 GSF 380 student beds 11 resident advisor beds 6 stories	110,000 GSF 354 student beds 11 resident advisor beds 6 stories	51,000 GSF 800 student seats 205 function seats 2 stories

The Project is located within Boston College's Lower Campus, which is generally bounded by Commonwealth Avenue, Thomas More Drive, Beacon Street, and the Boston-Newton line. The present land uses within the project site include a parking lot, existing modular housing, and open space. The project site will occupy approximately 11 acres.

Construction for the Project is scheduled to start May 1992 and be complete by September 1993.

The Project is an integral and important component of the Draft Boston College Master Plan dated December 1, 1991. The Master Plan has been approved by the Allston/ Brighton Boston College Community Relations Committee, a task force comprising residents of Allston and Brighton. The Boston Redevelopment Authority Board approved the plan on March 12, 1992. Among the objectives of the Master Plan are to provide more on-campus housing and to improve dining facilities for undergraduates. The Project supports these objectives.

IMPACTS

Impacts were assessed in accordance with the Scoping Determination. The findings of the impact analysis by category of impact area is as follows:

Transportation Impacts

Traffic. A Transportation Access Plan was prepared for the Project. The traffic analyses of existing conditions indicated that the operations at the unsignalized intersection of St. Thomas More Drive/Chestnut Hill Drive are currently acceptable. The signalized intersection of Commonwealth Avenue/Lake Street/St. Thomas More Drive and the unsignalized intersections of Beacon Street with Chestnut Hill Drive/Chestnut Hill Road and Reservoir Avenue/Boston College driveway currently have some problems during the peak commuting hours.

The new dormitories will provide on-campus housing for students who currently live off-campus and commute. Because these sophomore resident students are not allowed to have cars on campus and commuter trips will be eliminated, the Project will reduce traffic in the morning peak hour. In the afternoon, on those days when additional traffic may be generated by the function room in the Dining Facility, there will be a small increase in traffic.

Traffic conditions were evaluated for the year 1996 with and without the Project. The analyses assumed that the proposed student center and 800-space parking garage would be operational. Traffic conditions in 1996 with the Project were generally the same as conditions without the Project.

The Transportation Access Plan concluded with recommendations for the intersections currently experiencing problems. The recommendations will increase capacity at the intersections to the degree that they will be able to serve the existing and projected future traffic volumes efficiently. Table S-2 summarizes the recommendations.

TABLE S-2

SUMMARY OF RECOMMENDED INTERSECTION IMPROVEMENTS

Commonwealth Avenue/Lake Street/St. Thomas More Drive
• Revise signal timing and phasing. • Provide an exclusive right turn lane on westbound Commonwealth Avenue by eliminated MBTA on-street parking. • Restripe the eastbound approach of Commonwealth Avenue to provide an exclusive left turn lane. • Widen St. Thomas More Drive to provide three approach lanes to the intersection.
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road
• Provide police control during peak commuting hours. • Restripe Beacon Street to provide an exclusive left turn lane for vehicles turning onto Chestnut Hill Drive.
Beacon Street/Reservoir Avenue/Boston College driveway
• Monitor for future capacity deficiencies.

Parking. As part of the Transportation Access Plan the parking impacts of the Project were evaluated. Construction of the Project, as well as a new student center and a new parking garage (all to be constructed by 1996), will change the parking inventory of the Lower Campus. Table S-3 summarizes the location and quantity of spaces eliminated and replaced. An increase of 571 spaces will result after all the replacement parking is provided. Two hundred of these spaces will be used for increasing student resident parking in order to alleviate student parking in the neighborhood.

TABLE S-3

BOSTON COLLEGE LOWER CAMPUS PARKING SUMMARY

	Dormitory and Dining Facility Project 1993	Student Center and Parking Garage Project 1996	Total Lower Campus Parking 1996
Eliminated Parking			
Theater Lot	169	4	173
Lower Campus Road	58	90	148
Walsh Hall Lot	95		95
Buildings & Grounds Lot		31	31
Tennis Court Lot		114	114
Conte Forum Lot		33	33
Total Eliminated Spaces	322	272	594
Replacement Parking			
New Parking Garage		800	800
Elimination of 50 Parking Stickers	50		50
Hammond Pond Parkway Lot	200		200
1380 Soldiers Field Road Lot	50		50
General Restripping	50		50
St. Thomas More Hall Lot	15		15
Total Replacement Parking	365	800	1,165
Net Increase in Parking Spaces	43	528	571

As discussed in this summary under construction impacts there is also a significant need for temporary parking during construction for construction equipment, construction workers, and students. The construction mitigation plan provides for this replacement parking.

Environmental Protection

Shadows. Shadow studies were performed for the Project. The studies indicated that the shadows cast by the new buildings fall entirely within the confines of the campus and do not affect public sites in the area. The shadows fall predominantly on Lower Campus Road.

Solid Waste. The domestic waste generated by the Project will be collected daily by a contracted waste removal company. Boston College has an active recycling program that will be conducted in the new dormitories and the Dining Facility.

Geotechnical. Based on subsurface conditions Dormitory B and the eastern portion of Dormitory A will be supported by conventional spread footings. The Dining Facility and the western portion of Dormitory A will be supported on pressure-injected footings. Since all of the proposed structures have their lowest level slabs at or slightly above the present site grade and no below-grade space is currently being proposed, foundation construction is not anticipated to result in adverse movement or settlement of the adjacent ground surface.

Construction. Generally, 125 construction workers will be on site with a peak of 250 workers occurring for a three month period. They will work a 7:30 a.m. to 4:00 p.m. shift; thus they will have no impact to the peak commuting hours. Truck access to the site will be limited to the St. Ignatius gate. Trucks access to the site will be limited to major roadways.

Lower Campus Road will be closed during the day; one-way travel will be permitted during evenings and special events.

Parking on Lower Campus will be reduced by 322 spaces during construction. However, replacement parking, as listed in Table S-4, is proposed. The surplus parking spaces will be used by construction workers.

TABLE S-4

PARKING MITIGATION MEASURES DURING CONSTRUCTION

Restriping of existing Lower Campus parking areas	50 spaces
Re-signing of St. Thomas More Drive to permit parking for construction workers	60 spaces
Widening of St. Thomas More Hall Circle	15 spaces
Reduction of parking permits	50 spaces
Modifications of project's landscaping component	70 spaces
Off-campus parking lots with shuttle service to and from campus (Parking lots will be located on Hammond Pond Parkway and Soldier's Field Road)	250 spaces
Total Replacement Parking During Construction	495 spaces

Several mitigation measures will be undertaken during the construction period. These are listed in Table S-5.

TABLE S-5

CONSTRUCTION MITIGATION MEASURES

Noise	Work will generally occur between 7:30 a.m. and 4:00 p.m. Overtime needs will first be met by extending the workday to 5:00 p.m. Trucks will not be permitted to idle longer than 15 minutes.
Traffic	Construction workers will regularly be encouraged to use public transportation to and from the site. Truck activity will be minimized during peak hour traffic hours (7:30 a.m. to 9:00 a.m. and 4:00 p.m. to 5:00 p.m.). In the immediate area, deliveries will be restricted to Beacon Street, Commonwealth Avenue, and St. Thomas More Drive. Trucks will not be permitted on local residential streets. No double parking or traffic obstruction will be permitted by construction vehicles. Prior to construction of the project, a Construction Traffic and Staging Plan will be prepared. The plan will be a contractual obligation for all subcontractors and suppliers working on the project.
Dust	Dust-generating debris will be wetted. Storage of debris on-site will be minimized. Trucks hauling debris from the site will be covered. Dust-covered streets and sidewalks will be periodically cleaned.
Pedestrian Protection	A chain link fence will be placed around the perimeter of the project area. Walkways will be provided for pedestrians. Appropriate signage will be provided for pedestrian routing around the work area. Campus police will make security checks at least twice a night to ensure the site is secure.
Communications	There will be a designated representative for Boston College who will respond to any concerns regarding construction issues.

Urban Design

As designed, these new buildings, along with the architecturally significant St. Ignatius Church, frame the Lower Campus entry by forming a courtyard. The configuration of Dormitory A further emphasizes this passageway and defines a paved plaza in front of the Dining Hall. This plaza, which adjoins and extends into the existing Robsham Plaza, provides a Lower Campus space for informal gatherings and programmed activities.

The two dormitories will be six stories in height, approximately equal to the Robsham Theater and several stories shorter than Walsh and Edmonds Halls. The Dining Facility will be two stories with an approximate height of 35 feet at the eaves. The facade is broken with bays. The largely flat roofs are articulated with peaked sections at significant areas of the buildings. These features diminish the perceived mass of the structures, provide a more residential scale, and bridge the stylistic differences between the surrounding buildings.

Historic Resources Component

Soil samples taken in the area confirm the location of a filled manmade reservoir within the approximate contour of Lower Campus Road. The stratigraphy does not display any obvious sign of human occupation; this fact, combined with the construction plans, which recommend slabs-on-grade for Dormitory B and the Dining Facility and above-grade slabs for Dormitory A, suggests that the impacts of the projects to cultural resources are minimal.

Infrastructure Systems

Infrastructure demands from the Project are small and able to be accommodated by the existing off-site utility systems.

Water. The estimated water demand for the Project is approximately 62,000 gallons per day. Water conservation measures will be employed in each of the buildings and will include the use of low flow toilets, aerator-type faucets and shower heads, and energy efficient water heaters. The water supply available at the project site is adequate to meet the proposed domestic and fire protection demands.

Construction of the proposed water distribution system will require the crossing of two MWRA (Massachusetts Water Resources Authority) aqueducts. Boston College is working closely with the MWRA to ensure that the aqueducts are accurately located and properly protected during construction. The operation of the aqueducts will not be interrupted during construction. Disruption of existing water service will be minimized.

Wastewater. The wastewater discharged form the proposed facilities is estimated to be approximately 58,000 gallons per day. Capacity in the existing sewer system is sufficient to accommodate the wastewater discharge from the proposed facilities. Gravity sewers will be constructed on the project site to convey wastewater discharge from the proposed buildings to a newly constructed on-site pumping station. The new pumping station will replace the two existing stations currently being used. To prevent the disruption of sewer service during construction, the two existing stations will remain operational. Once the new pumping station is complete the existing stations will be abandoned.

Storm Drainage. A new gravity storm drain will be constructed to convey runoff from the project site to the existing storm drain located in Lower Campus Road. The existing storm drainage system is capable of handling the volume and peak rate of runoff discharged from the proposed Project.

Utility Systems. The Project's natural gas and power requirements can by met by Boston Gas and Boston Edison. The city of Boston municipal fire alarm circuit is available on Campus for connection of fire alarm systems to the fire department supervisory system.

Telephone, computer, and cable television systems are presently distributed by Boston College privately.

Summary

The Project will have minimal impacts with the proposed mitigation. Impacts to be mitigated are generally transportation and construction-related. Regardless of the Project, certain traffic improvements are needed.

As a result of the Project, permanent on-site replacement parking needs to be provided. The proposed parking garage will provide replacement parking. During construction proper procedures will be taken so that disruption to the area will be minimized to the extent possible.

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CHAPTER 1

GENERAL INFORMATION

APPLICANT INFORMATION

This chapter contains basic information concerning the project, including the project team, financial and legal information, the project area, regulatory controls and permits, and community benefits.

Project Team

Owner:
Trustees of Boston College
140 Commonwealth Avenue
Chestnut Hill, MA 02167
Attn: John T. Driscoll
Vice President for Administration
Boston College - Haley House
314 Hammond Street
Chestnut Hill, MA 02167
(617) 552-8878

Legal Counsel:
Rackemann, Sawyer & Brewster, P.C.
One Financial Center, 29th Floor
Boston, MA 02111
Attn: John J. Griffin, Jr.
(617) 542-2300

Architect:
Perry, Dean, Rogers & Partners
177 Milk Street
Boston, MA 02109
Attn: Janet Stegman/Frank Maguire
(617) 423-0100

Traffic and Environmental Consultant:
Rizzo Associates, Inc.
235 West Central Street
Natick, MA 01760
Attn: Elizabeth K. Levin
(508) 651-3401

Historic and Archaeological Consultant:

Timelines, Inc.
316 Boston Road
Groton, MA 01450
Attn: Michael Roberts
(508) 448-2585

HVAC/Electrical Engineers:

BR&A Consulting Engineers
1320 Soldiers Field Road
Boston, MA 02135
Attn: Eugene Bard
(617) 254-0016

Plumbing Engineers:

R.W. Sullivan, Inc.
302 Union Wharf
Boston, MA 02109
Attn: Grant Anderson
(617) 523-8227

Structural Engineers:

Le Messurier Consultants
1033 Massachusetts Avenue
Cambridge, MA 02138
Attn: Peter Cheever
(617) 868-1200

Construction Manager:

Perini Corporation
73 Mt. Wayte Avenue
P.O. Box 9160
Framingham, MA 01701
Attn: Peter Rizzuto
(508) 875-6171

Legal Information: The owner is not aware of any legal judgments or actions pending concerning the Project. The owner is the sole fee owner of the project site.

FINANCIAL INFORMATION

Pro forma financial information typically required of a commercial development is not applicable here.

Boston College is considering financing alternatives including possible public agency financing for the Project.

PROJECT AREA

The property address is 140 Commonwealth Avenue, Chestnut Hill, MA 02167.

The Project will be located on Boston College's Lower Campus, along Lower Campus Road. The Project Site is adjacent to the boundary between the cities of Newton and Boston.

The site plan submitted separately with this submission shows the project area and the site survey.

PUBLIC BENEFITS

The public benefits associated with the Project are described in further detail in the Master Plan entitled *Boston College Master Plan for Physical Facilities Development 1991-2001*, filed with the Boston Redevelopment Authority and approved March 12, 1992 (the "Approved Master Plan") and a document entitled "Memorandum of Understanding" by and between the Allston/Brighton-Boston College Community Relations Committee and Boston College, dated January 27, 1992 (the "Memorandum of Understanding").

The public benefits that are associated with the Project include a Boston Residents Construction Plan prepared in accordance with The Boston Residents Jobs Policy, effective July 12, 1985, and an Employment Opportunity Plan which will be submitted to The Mayor's Office of Jobs and Community Services.

The Project will generate 31 new permanent jobs, 150 new part-time student jobs, and approximately 500 design and construction-related jobs.

REGULATORY CONTROLS AND PERMITS

Zoning

The project area is located within the Boston College Institutional Subdistrict Area established in accordance with Article 51 of the Zoning Code, which establishes the Allston-Brighton Neighborhood District. As an institutional use, the Project is an allowed use, subject to the provisions of Article 51. Section 51-28 of Article 51 provides that any proposed project which is determined to be consistent with an applicable Institutional Master Plan adopted pursuant to Section 51-29 shall be deemed to be in compliance with the dimensional, parking, and loading requirements of Article 51. Development of the Project within the Boston College Institutional Subdistrict is consistent with the zoning controls that are set forth in the Approved Master Plan.

Given the Project's consistency with the Approved Master Plan, it is assumed that it is allowed.

The Project is a Large Scale Development Project under Section 28-4 of the Zoning Code and is therefore subject to review by the Boston Civic Design Commission.

The applicant will comply with the filing requirements of Article 31A.

Other Local Nonzoning Permits, and Approvals

Boston Licensing Board

- Lodging House License (G.L. c. 140 §23)

Inspectional Services Department

- Demolition Permits
- Building Permits
- Utility Installation Permits
- Elevator Certificates

Board of Health and Hospitals

- Milk Sale License (G.L. c.94 §40)
- Food Services License, (105 CMR 590.052, City of Boston Ord. §16-1.6)
- Board of Health Approval of Plans for Bakery (G.L. c.94 §9M)

Fire Department

- Fire Department Permit for Bakery Oven (Fire Code §26)
- Fire Department Permit for Rubbish Storage or Handling (Fire Code §29)

Water and Sewer Commission

- Boston Water and Sewer Commission sign-off on state sewer permit application

State Permits and Approvals

Secretary of Environmental Affairs

- Massachusetts Environmental Policy Act

Division of Water Pollution Control

- Sewer Connection Permit

Massachusetts Water Resources Authority

- Sewer Connection Permit

Federal Permits and Approvals

Environmental Protection Agency

- National Pollution Discharge Elimination System (NPDES) Permit for construction on 5+ acres, and/or construction dewatering (if and as necessary)

Applications for these permits will be made as plans and other supporting documentation are available.

Massachusetts Environmental Policy Act

The owner intends to submit an Environmental Notification Form (ENF) to the MEPA Unit of the Executive Office of Environmental Affairs. It expects that the MEPA Unit will determine that no Environmental Impact Report will be required for the Project. In the event that an Environmental Impact Report is required, the applicant will undertake every effort to coordinate review with the BRA.

COMMUNITY GROUPS

Names and Addresses of Project Area Owners, Abutters, and Community Groups

The owner of the Project Site is Trustees of Boston College. The address of the College is:

Boston College
140 Commonwealth Avenue
Chestnut Hill, Massachusetts 02167

The Project Area is within Boston College boundaries. The abutters are:

St. Ignatius Church
29 Commonwealth Avenue
Chestnut Hill, Massachusetts 02167

Ms. Grace Wyshak
32 Commonwealth Avenue
Newton, Massachusetts 02167

Several community groups are interested in or affected by the Project. These groups and their membership are listed in Table 1-1, as well as referred to in Section 9 of the Approved Master Plan.

TABLE 1-1

COMMUNITY GROUPS

Name	**Address**
ALLSTON-BRIGHTON/BOSTON COLLEGE COMMUNITY RELATIONS COMMITTEE	
Stephen Costello	120 Lake Street Brighton, 02135
John Camelia	10 Porstmouth Street Brighton
Donald Chalmers	19 Egremont Road Brighton
Lucy Tempest	21 Shannon Street Brighton
Alan Morganroth	156 Lake Street Brighton
Helen Pillsbury	1875 Commonwealth Avenue Brighton
Ray Mellone	53 Coolidge Road Allston 02134
Peter Barry	8 Melton Street Brighton
Marion Alford	40 Lake Street Brighton
Bob Dunn	30 Aldie Street Allston 02134
Tom Miller	21 Parkvale Avenue Allston 02134
Gerry Kavanaugh	Boston Redevelopment Authority 1 City Hall Square Boston 02210
Terry Cohen	8 Egremont Road Brighton
NEWTON CAMPUS COMMITTEE	
Mrs. Alice B. Bailey	103 Blake Street Newtonville 02160

TABLE 1-1 (Continued)

COMMUNITY GROUPS

Name	Address
Mr. Howard Gutherman	31 Rochester Road Newton 02158
Mr. Robert Faneuil	56 Cotton Street Newton 02158
Dr. Albert Cohen	29 Cotton Street Newton 02158
Mr. James Wexler	22 Exmoor Road Newton 02159
Mrs. Susan Leiber	18 Rochester Road Newton 02158
Mr. Mark D. Mancuso	34 Rochester Road Newton 02158
CHESTNUT HILL ASSOCIATION (Directors)	
George P. Beal	15 Lee Road Chestnut Hill
H. Day Brigham, Jr.	92 Reservoir Avenue Chestnut Hill
Mrs. Phyllis Conway	37 Reservoir Avenue Chestnut Hill
Mrs. Marcia Damon	44 Old England Road Chestnut Hill
Dr. Georgiana Donato-McCormack	90 Beacon Street Chestnut Hill
Mr. Edward L. Emerson	59 Essex Road Chestnut Hill
Mr. Anne E. Flax	32 Gatehouse Road Chestnut Hill
Dr. Nancy Friedman	401 Beacon Street Chestnut Hill
Mrs. Renee Golden	83 Hammondswood Road Chestnut Hill
Mr. John L. Grandin, III	42 Lawrence Road Chestnut Hill
Mr. Thomas J. Greytak	29 Acacia Avenue Chestnut Hill

TABLE 1-1 (Continued)

COMMUNITY GROUPS

Name	Address
Mr. Charles T. Haydock	59 Reservoir Avenue Chestnut Hill
Dr. Shelby Kashkat	97 Manet Road Chestnut Hill
Mrs. Patricia Kneafsey	72 Beacon Street Chestnut Hill
Mrs. Agnes Korosi	54 Old Colony Road Chestnut Hill
Mr. Owen Larkin	100 Hammond Street Chestnut Hill
Mr. Thomas A. McMullin, Jr.	11 Meigh Road Chestnut Hill
Mr. Samuel D. Perry	26 Old Orchard Road Chestnut Hill
Mr. Charles E. Porter	(Tel. No. 292-1222)
Mrs. Carol Post	33 Chestnut Hill Road Chestnut Hill
Mr. Edwin Resnick	62 Manet Road Chestnut Hill
Ms. Virginia Ronan	32 Crosby Road Chestnut Hill

List of Meetings

Representatives of Boston College have met with various groups and individuals within the Allston/Brighton neighborhood to discuss the Project. For a list of the groups consulted, please refer to Section 9 of the Approved Master Plan.

CHAPTER 2

TRANSPORTATION COMPONENT

A complete Transportation Access Plan, contained in Appendix B, was conducted for the Project in accordance with the city of Boston's Guidelines and Scoping Determination. The following chapter presents a summary of the findings of the Transportation Access Plan.

The key roadways whose operation affects and is affected by traffic generated from Boston College are on the campus boundaries; namely, Commonwealth Avenue (north), St. Thomas More Road (east), Beacon Street (south), and College Road (west). The area addressed in the access plan was confined to Boston city limits and, accordingly, includes portions of all of the above-mentioned campus boundary roads with the exception of College Road.

The study evaluated the following intersections for impacts resulting from traffic generated by the two new dormitories and dining hall facility:

- Commonwealth Avenue/Lake Street/St. Thomas More Drive/Fr. Herlihy Terrace
- Beacon Street/Chestnut Hill Drive/Chestnut Hill Road
- St. Thomas More Drive/Chestnut Hill Drive
- Beacon Street/Reservoir Avenue/Boston College driveway

The traffic analysis indicated that the signalized intersection of Commonwealth Avenue/ Lake Street/St. Thomas More Drive and the unsignalized intersections of Beacon Street with Chestnut Hill Drive/Chestnut Hill Road and Reservoir Avenue/Boston College driveway are operating at unacceptable levels of service during the existing peak commuting hours. These intersections currently require improvements to increase vehicle capacity and reduce delays to motorists.

Detailed trip generation and distribution studies were performed for the Project that evaluated both trips generated and eliminated by the Project. The new dormitories will provide on-campus housing for students who currently are off-campus and commute. It was found that the reduction of commuter students actually reduces traffic in the morning peak hour. In the afternoon (under worse case conditions), when traffic is generated by the function room in the dining hall, an increase in traffic results. Tables 2-1, 2-2, and 2-3 present a summary of the Project trip generation. Overall, a net increase of 44 trips is generated per weekday, with a decrease of 70 trips results for the morning peak hour and a net increase of 150 trips results for the afternoon peak hour.

TABLE 2-1

SUMMARY OF NEW TRIPS

	Average Weekday Trips	Peak Hours					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Dormitories							
Students	0	0	0	0	0	0	0
Resident Assistants	22	0	6	6	6	0	6
Visitors	176	15	15	30	15	15	30
Housekeeping Staff	8	0	0	0	0	0	0
Service Vehicles	6	0	0	0	0	0	0
Dining Hall Facility							
800 student seats	0	0	0	0	0	0	0
305 function room seats	342	0	0	0	171*	0	171*
Staff	106	0	0	0	0	0	0
Vendors and Visitors	50	6	6	12	0	0	0
Total New Trips	710	21	27	48	192	15	207

* These trips will only occur if a new function is held on campus. It is anticipated that on a worse case basis two new functions will be held per week.

TABLE 2-2

SUMMARY OF ELIMINATED TRIPS

	Average Weekday Trips	Peak Hours					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Modular Housing Buildings							
Students	36	0	14	14	14	0	14
Visitors	28	3	3	6	3	3	6
Walsh Hall Cafeteria							
Students	0	0	0	0	0	0	0
Staff	64	0	0	0	0	0	0
Vendors and Visitors	50	6	6	12	0	0	0
Commuter Students	488	86	0	86	0	37	37
Total Trips Eliminated	666	95	23	118	17	40	57

TABLE 2-3

TRIP GENERATION SUMMARY

	Average Weekday Trips	Peak Hours					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
New Trips	710	21	+27	_48	192	15	+207
Eliminated Trips	-666	-95	-23	+118	-17	-40	-57
Total Trips	44	-74	4	-70	175	-25	+150

Traffic conditions were evaluated for the 1996 condition with and without the Project. To determine peak hour traffic volumes in 1996, the existing peak hour traffic volume networks were increased by one percent per year and traffic generated by other planned developments was added to the networks. A slight worsening in traffic conditions at the intersections currently operating over capacity resulted for the Future No-Build condition.

When traffic generated by the project was added to the No-Build traffic volumes and the intersections reanalyzed, the levels of service for the Build condition were generally the same as for the No-Build condition. Table 2-4 summarizes the level of service for the existing, No-Build, and Build conditions.

In addition to traffic, parking on Lower Campus was evaluated in the Transportation Access Plan. Construction of this project, as well as a new student center and a new parking garage (all to be constructed on Lower Campus and completed by 1996), will significantly impact the parking inventory on Lower Campus. Table 2-5 summarizes the location and quantity of spaces eliminated and replaced. An increase of 571 spaces will result upon construction of all the replacement parking. Two hundred of these spaces will be used for increasing student resident parking in order to alleviate student parking in the neighborhood.

The Transportation Access Plan concluded with recommendations for the intersections currently operating over capacity. The recommendations will increase capacity at the intersections to the degree that they will be able to serve the existing and projected future traffic volumes efficiently and with minimal delay to motorists. Table 2-6 summarizes the recommendations.

TABLE 2-4

LEVEL OF SERVICE SUMMARY

	AM Peak Hour						PM Peak Hour					
	Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)		Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)	
Unsignalized Intersections	ARC* (p.c.p.h.)**	LOS***	ARC	LOS	ARC	LOS	ARC	LOS	ARC	LOS	ARC	LOS
St. Thomas More Drive/Chestnut Hill Drive												
LT onto Chestnut Hill Drive	745	A	805	A	815	A	818	A	792	A	729	A
All movements from Chestnut Hill Drive	305	B	312	B	317	B	282	C	226	C	177	D
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road												
LT onto Chestnut Hill Drive	228	C	149	D	156	D	237	C	190	D	95	E
All movements from Chestnut Hill Road	50	E	24	E	26	E	9	E	-1	F	-8	F
RT from Chestnut Hill Drive	446	A	391	B	397	B	295	C	209	C	150	D
Th/LT from Chestnut Hill Drive	-34	F	-52	F	-53	F	-66	F	-82	F	94	F
Beacon Street/Reservoir Avenue/Boston College driveway												
LT onto Boston College Drive	299	C	197	D	199	D	350	B	299	C	265	C
LT from Reservoir Avenue	49	E	30	E	30	E	33	E	13	E	8	E
RT from Reservoir Avenue	130	D	79	E	78	E	377	B	339	B	294	C
LT from Boston College Drive	+15	E	4	E	4	E	-45	F	-62	F	-63	F
Th/RT from Boston College Drive	457	A	421	A	424	A	186	D	135	D	138	D
Commonwealth Avenue/Fr. Herlihy Terrace												
LT onto Fr. Herlihy Terrace	239	C	218	C	225	C	434	A	406	A	397	B

	AM Peak Hour						PM Peak Hour					
	Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)		Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)	
Signalized Intersection	Delay++	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Commonwealth Ave./Lake St./St. Thomas More Dive	49.2	E	65.2	F	60.6	F	188.1	F	243.5	F	228.9	F

* ARC - available reserve capacity
** p.c.p.h. - passenger cars per hour
*** LOS - Level of Service
+ Delay - average stopped delay per vehicle in seconds

TABLE 2-5

BOSTON COLLEGE LOWER CAMPUS PARKING SUMMARY

	Dormitory and Dining Facility Project 1993	Student Center and Parking Garage Project 1996	Total Lower Campus Parking 1996
Eliminated Parking			
Theater Lot	169	4	173
Lower Campus Road	58	90	148
Walsh Hall Lot	95		95
Buildings & Grounds Lot		31	31
Tennis Court Lot		114	114
Conte Forum Lot		33	33
Total Eliminated Spaces	322	272	594
Replacement Parking			
New Parking Garage		800	800
Elimination of 50 Parking Stickers	50		50
Hammond Pond Parkway Lot	200		200
1380 Soldiers Field Road Lot	50		50
General Restripping	50		50
St. Thomas More Hall Lot	15		15
Total Replacement Parking	365	800	1,165
Net Increase in Parking Spaces	43	528	571

TABLE 2-6

SUMMARY OF RECOMMENDED INTERSECTION IMPROVEMENTS

Commonwealth Avenue/Lake Street/St. Thomas More Drive
• Revise signal timing and phasing. • Provide an exclusive right turn lane on westbound Commonwealth Avenue by eliminating MBTA on-street parking. • Restripe the eastbound approach of Commonwealth Avenue to provide an exclusive left turn lane. • Widen St. Thomas More Drive to provide three approach lanes to the intersection.
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road
• Provide police control during peak commuting hours. • Restripe Beacon Street to provide an exclusive left turn lane for vehicles turning onto Chestnut Hill Drive.
Beacon Street/Reservoir Avenue/Boston College driveway
• Monitor for future capacity deficiencies.

CHAPTER 3

ENVIRONMENTAL PROTECTION COMPONENT

SHADOWS

The figures on the following pages (Figures 3-1 through 3-12) describe the shadows that will be cast by the proposed new buildings on adjacent buildings and spaces. The views depict shadow conditions at 9:00 a.m., 12:00 noon, and 3:00 p.m. for the vernal equinox, summer solstice, autumnal equinox, winter equinox, and winter solstice.

As these studies indicate, shadows cast by the new buildings fall entirely within the confines of the campus and in no way affect public sites in the area. Within the campus new shadows are predominantly on Lower Campus Road, while future green space remains unhampered by the positioning of the dormitories and the dining facility.

SOLID AND HAZARDOUS WASTES

Hazardous Waste

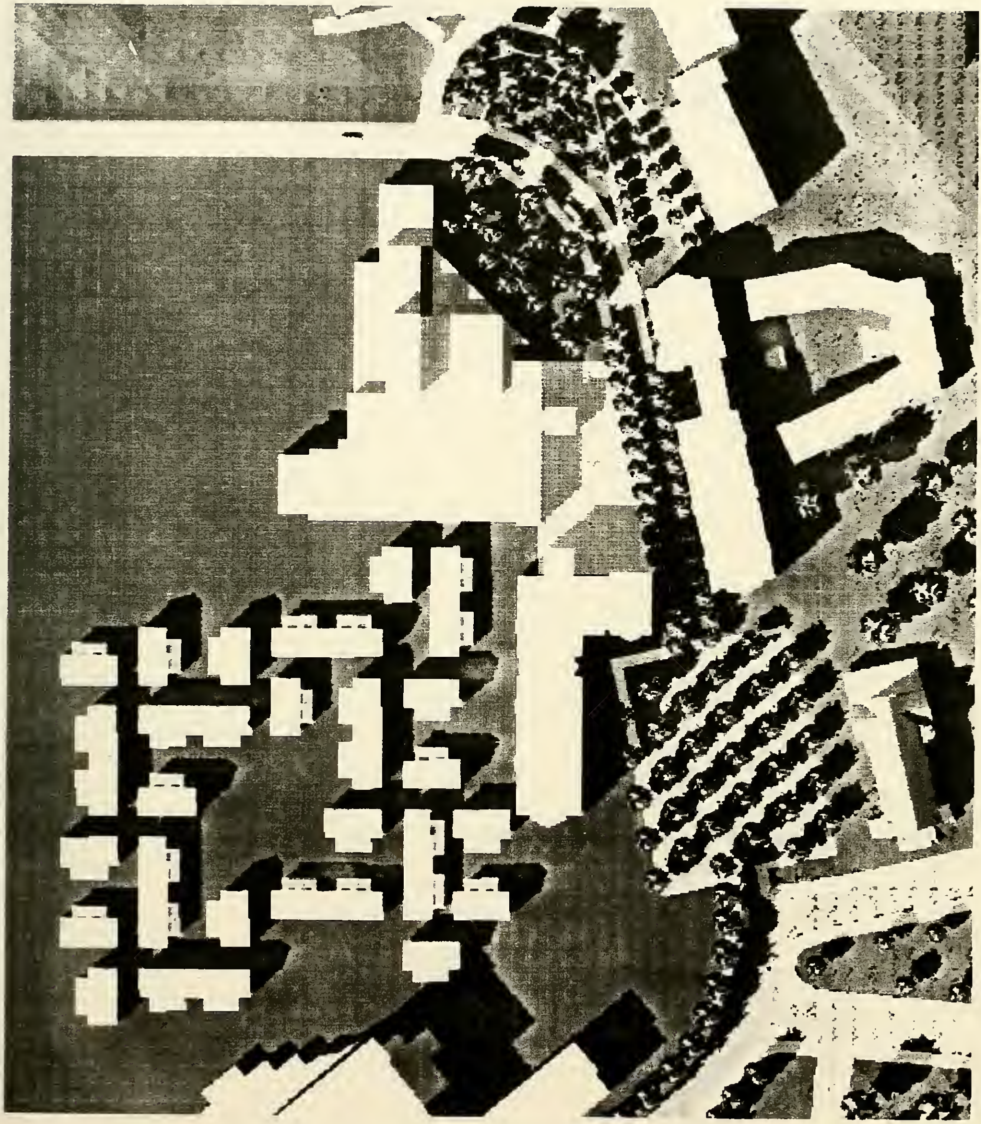
A hazardous waste site assessment of the project area is currently being conducted and will be complete in the near future.

Solid Waste

Currently Boston College waste is collected daily by a contracted waste removal company. Domestic waste from the existing dormitories generates 57 percent of the total waste. The athletic department generates 3 percent, and the remaining 40 percent is produced by administration and faculty.

To determine the waste that will be generated by the net increase in beds on campus resulting from the Project, an evaluation of two existing dormitories was performed. In the Walsh Hall and Edmonds dormitories, 1,594 students and staff generate daily approximately 40 cubic yards of waste. Dividing the daily quantity of waste by the total number of students indicates that approximately 0.025 cubic yards of waste per day are generated by each student. Therefore, multiplying this rate by the increase in beds on campus (614) demonstrates that the new dormitories will generate approximately 15 cubic yards of waste each day.

The existing Walsh Hall dining facility generates 6 cubic yards of compacted waste each day. The dining facility at Walsh Hall will be closed upon opening of the new facility. The new dining hall facility will serve the same students as Walsh Hall currently serves in addition to the new resident students. Occasionally, additional functions may be held

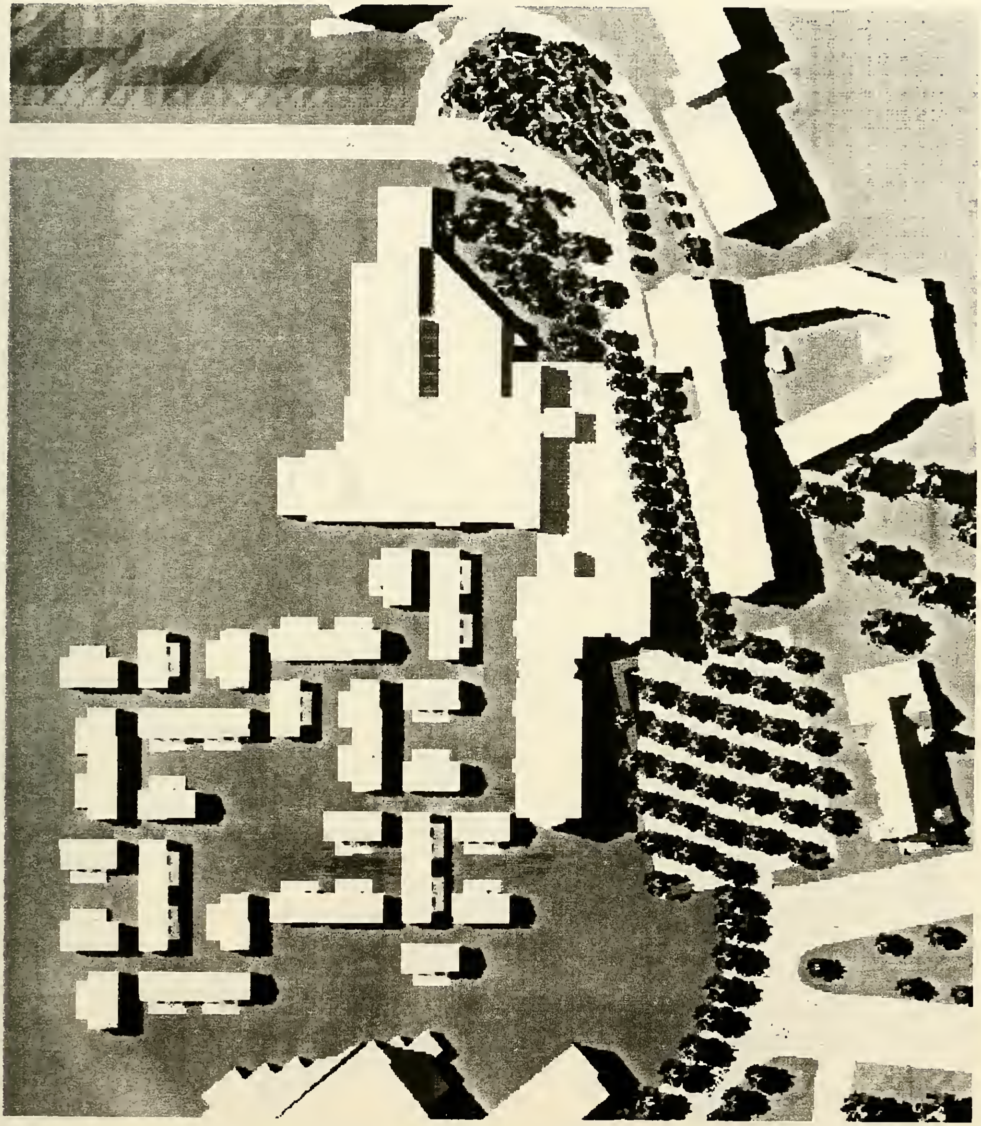


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 1

Shadow Study
March 20 9:00 AM

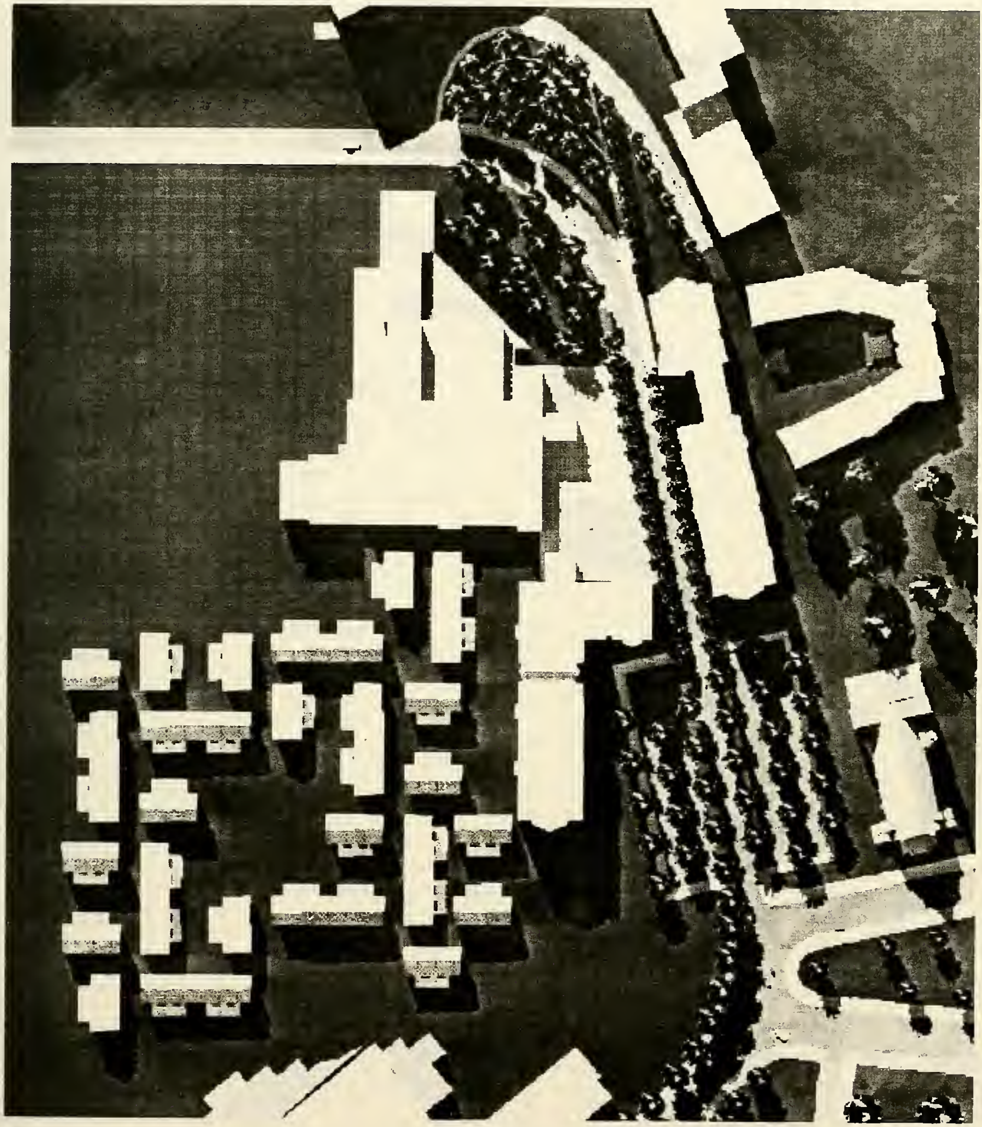


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 2

Shadow Study
March 20 Noon

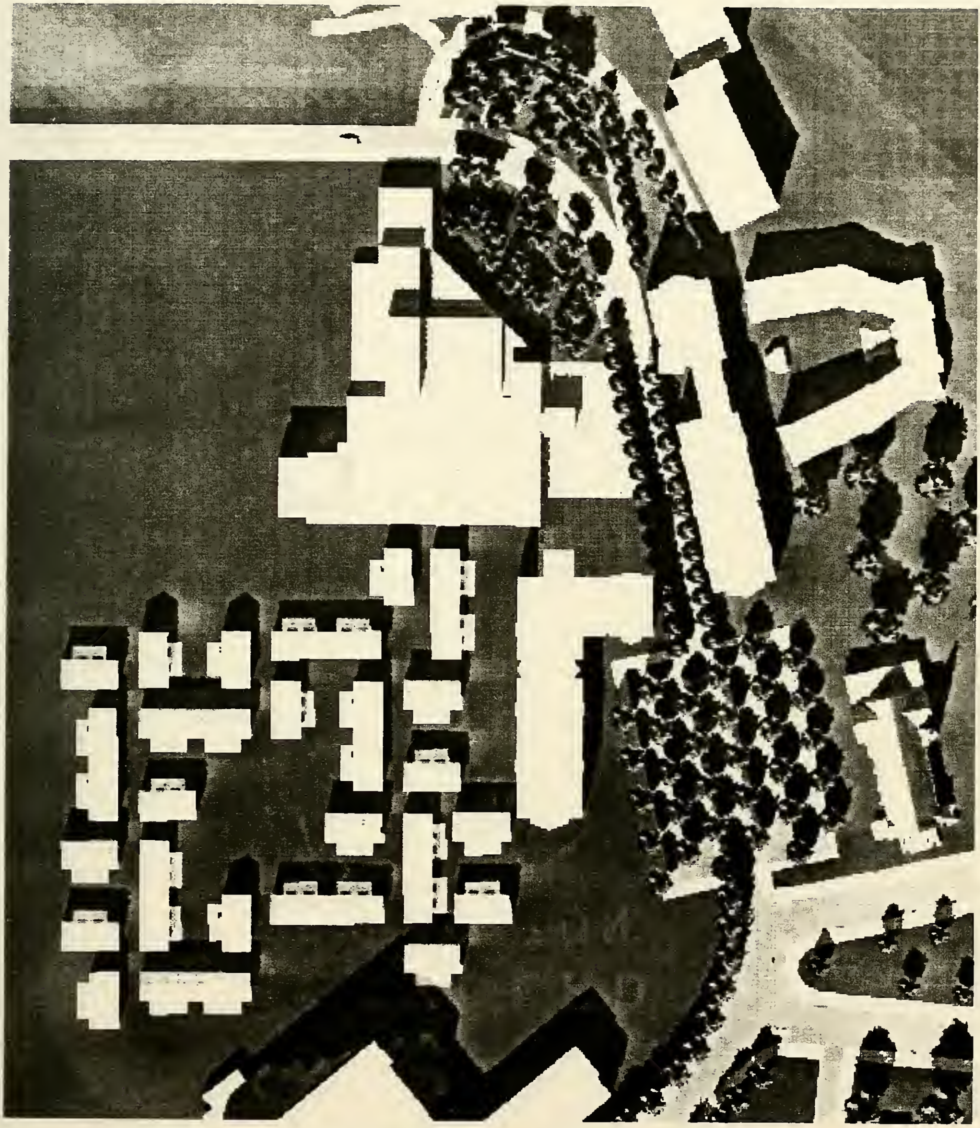


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 3

Shadow Study
March 20 3:00 PM

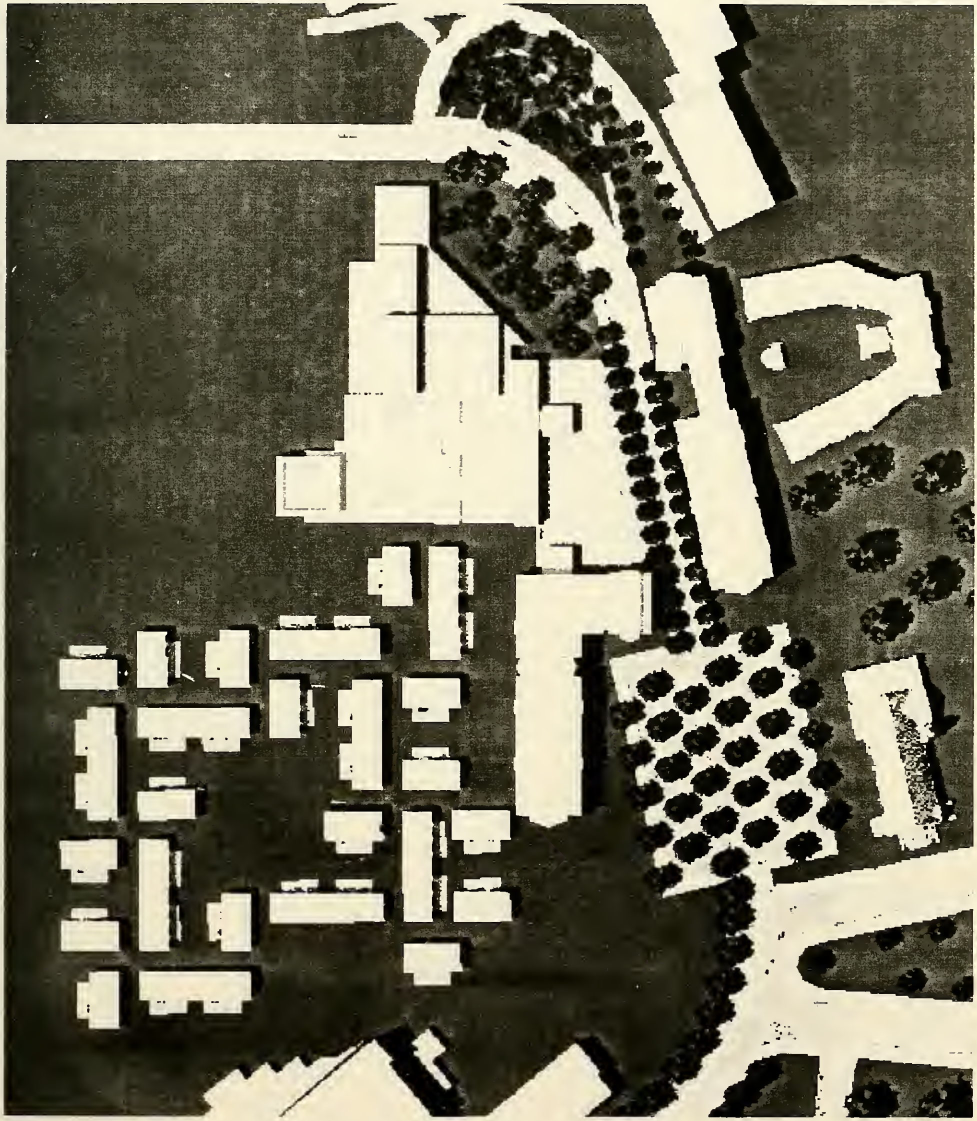


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 4

Shadow Study
June 21 9:00 AM

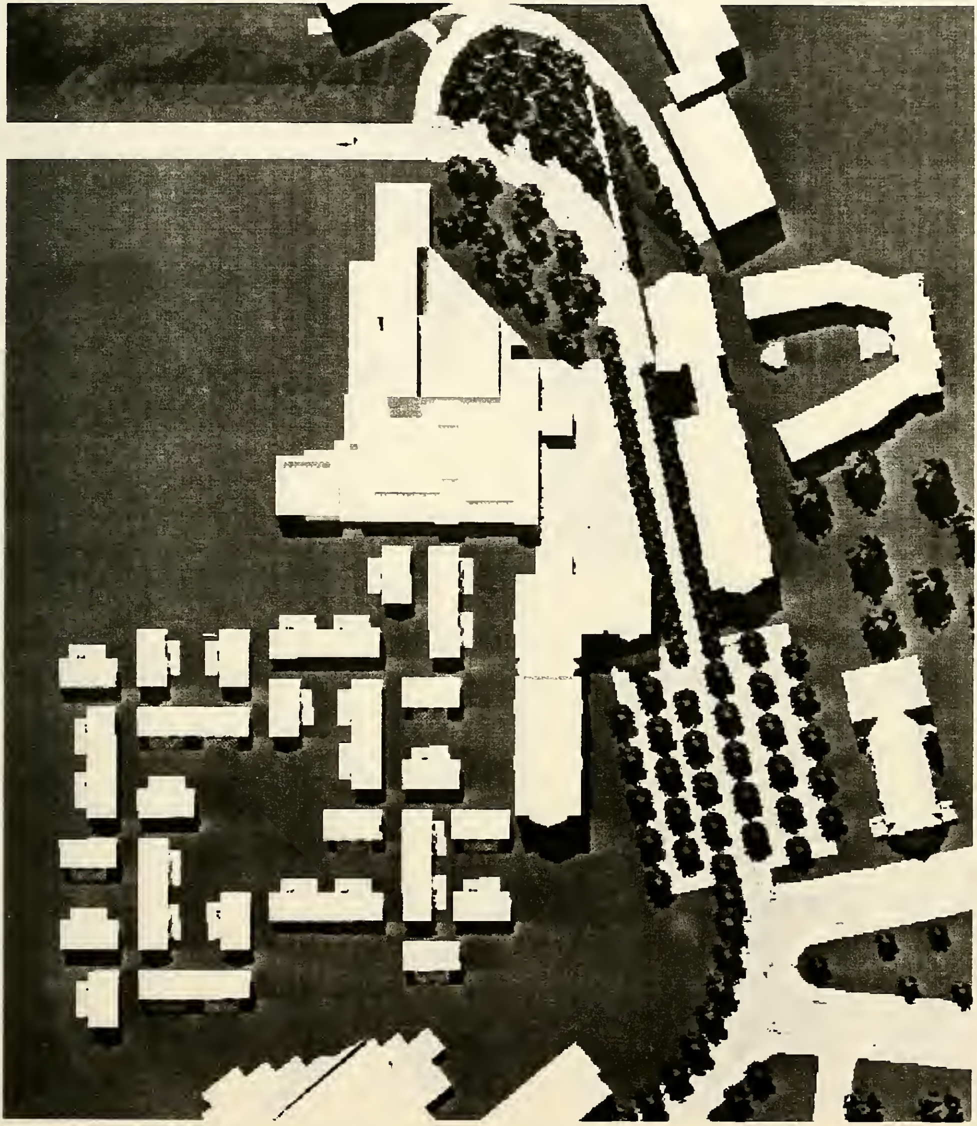


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 5

Shadow Study
June 21 Noon

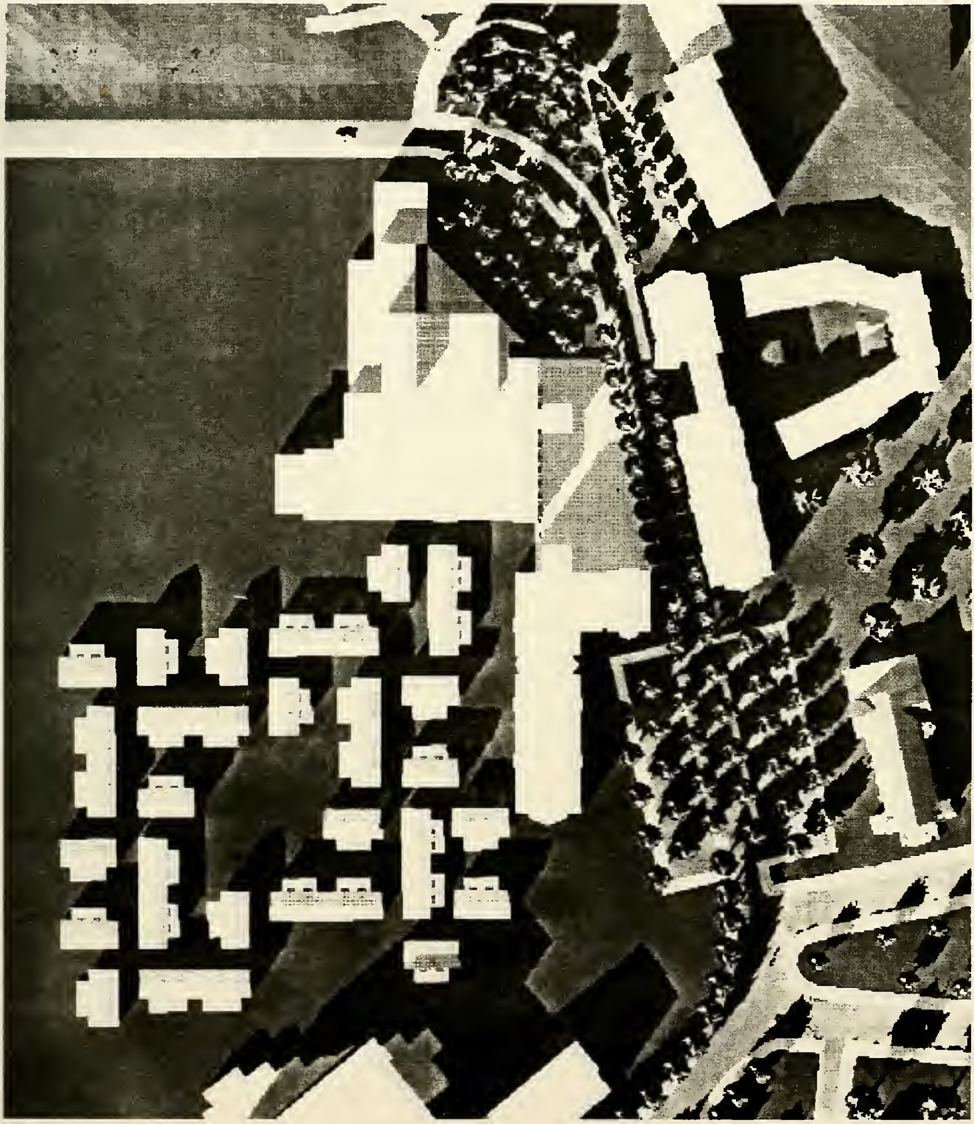


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 6

Shadow Study
June 21 3:00 PM

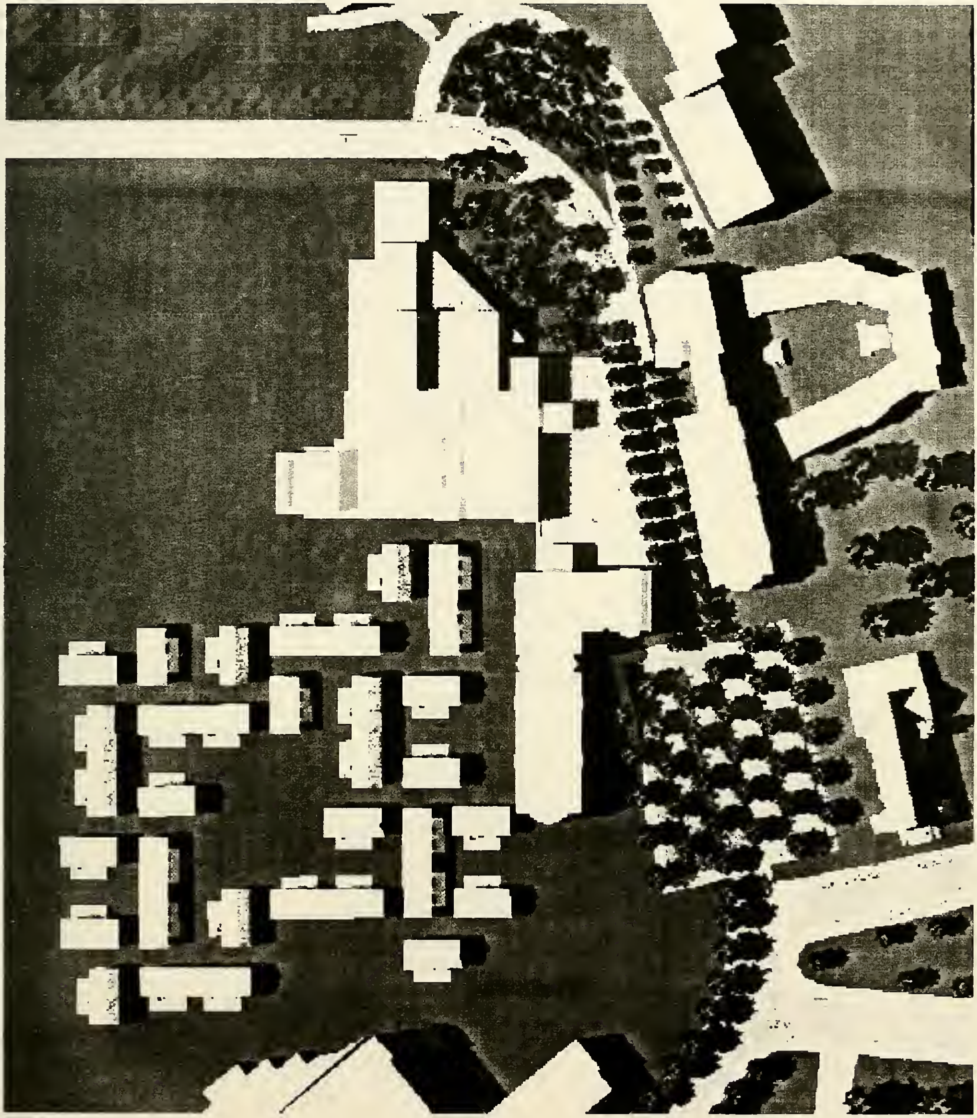


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 7

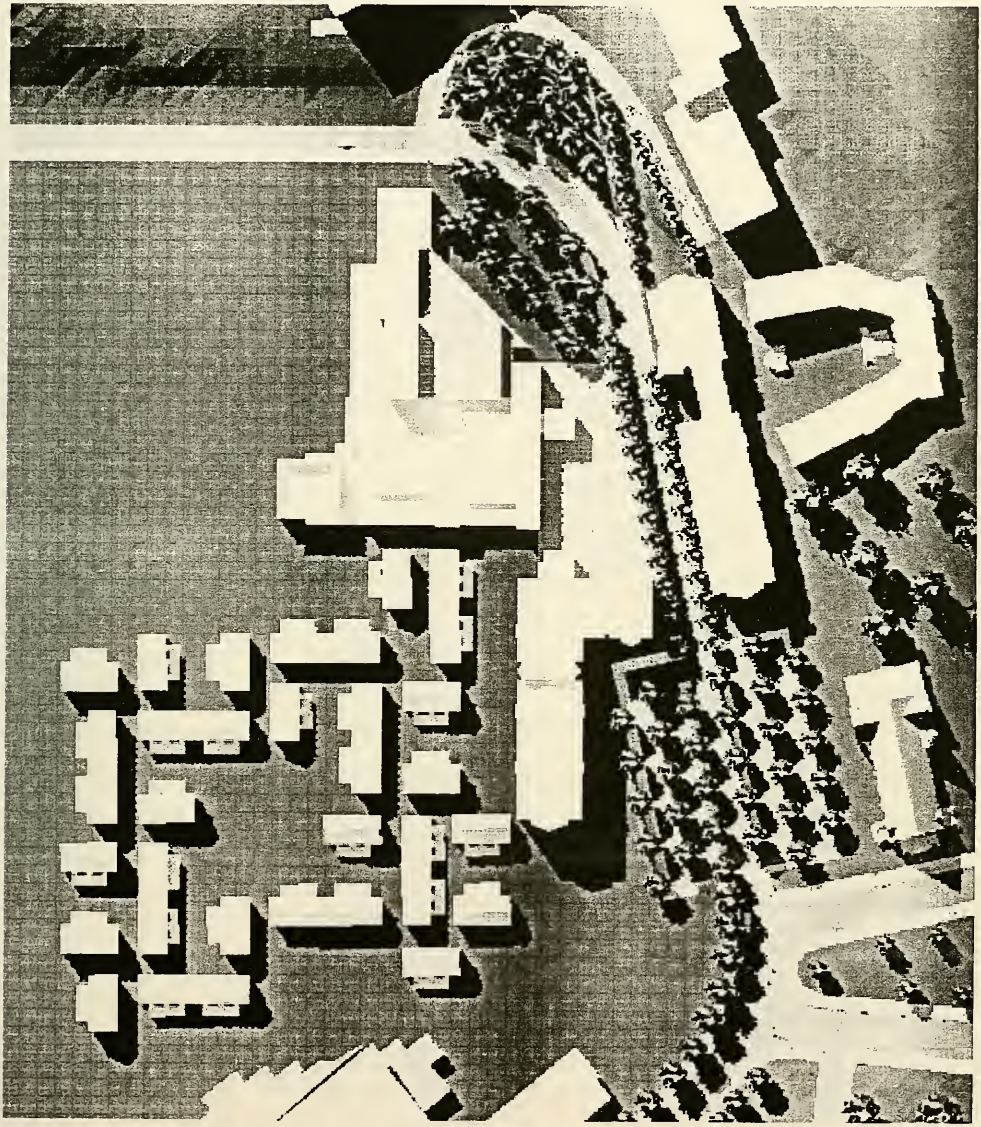
Shadow Study
September 20 9:00 AM



Boston College
Lower Campus Project

Not to Scale

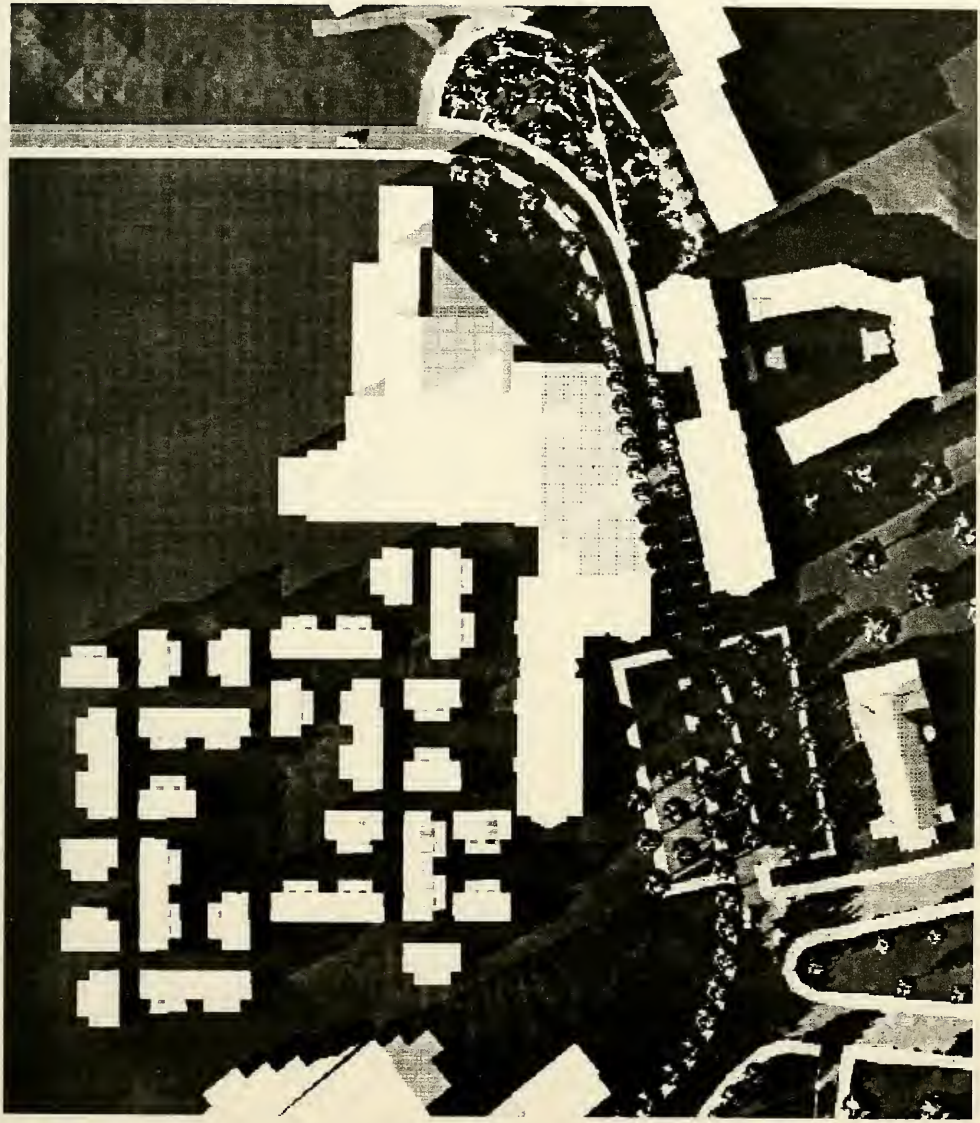
Figure 3 – 8
Shadow Study
September 20 Noon



Boston College
Lower Campus Project

Not to Scale

Figure 3 – 9
Shadow Study
September 20 3:00 PM

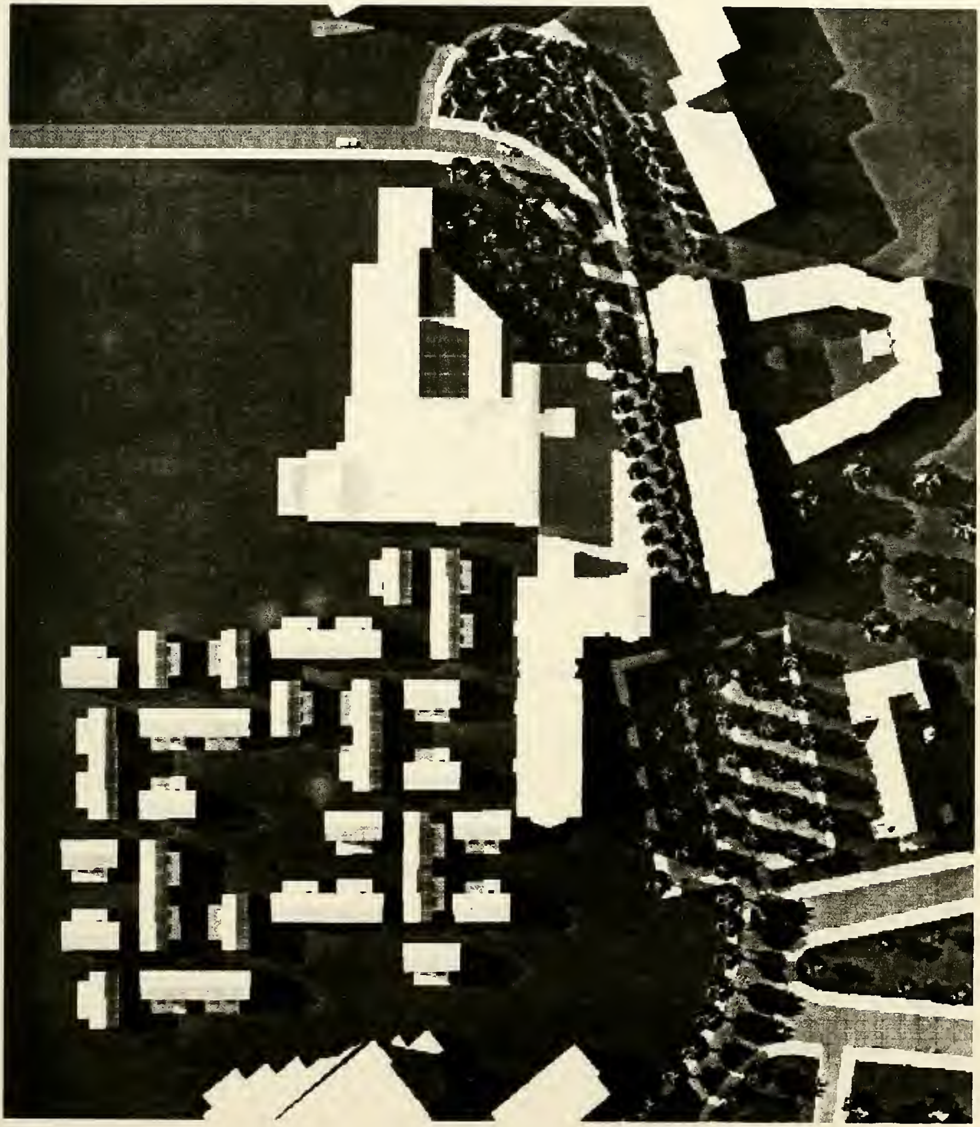


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 10

Shadow Study
December 21 9:00 AM.

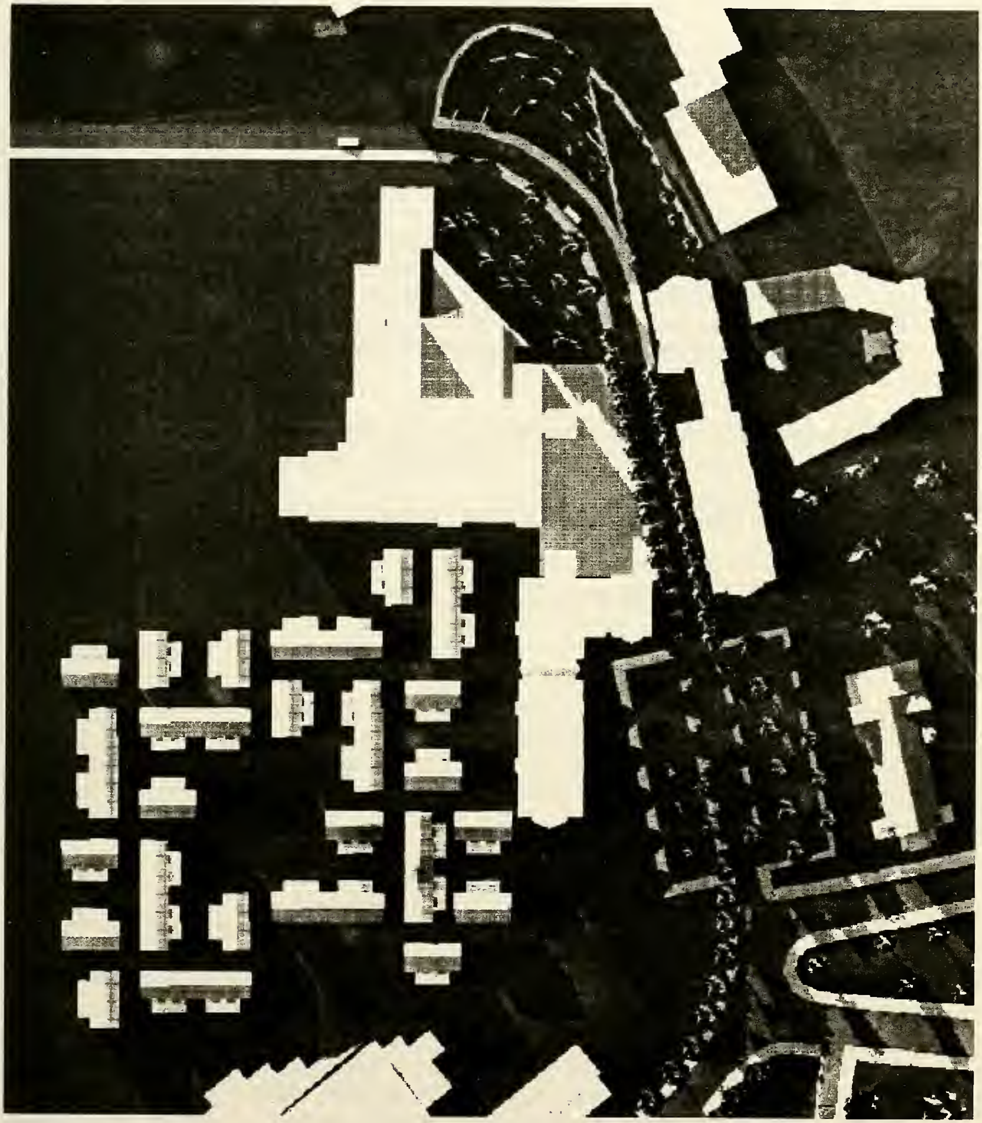


Boston College
Lower Campus Project

Not to Scale

Figure 3 – 11

Shadow Study
December 21 Noon .



Boston College
Lower Campus Project

Not to Scale

Figure 3 – 12
Shadow Study
December 21 3:00 PM.

in the new facility. It is conservatively estimated that the new dining hall facility will generate 10 cubic yards of compacted waste per day. As is currently done, the waste will be collected daily before 9:00 a.m.

Recycling

Boston College has instituted a comprehensive Residence Hall Recycling Program known as "Just Redo It!" Aluminum cans, newspapers, and mixed paper are all collected on a weekly basis in the dormitories. Approximately 0.75 pounds of newspaper and 0.75 pounds of mixed paper are generated by individual students per week. Cans are picked up by student volunteers and the money received for the cans is given to local charity.

Corrugated boxes and plastics are recycled in the dining facilities. Approximately one ton of corrugated boxes is collected each week.

In addition to recycling conducted in the dormitories and dining halls, mixed paper and newspapers are also recycled by administration and facility.

These same items will be recycled in the new dormitories and dining hall facility.

GEOTECHNICAL

The existing subsoil and groundwater conditions were defined by means of 21 soil borings and 32 rock probes performed within the immediate area of the Project. These explorations indicated that the subsurface conditions varied significantly from the portion of the site located within the former reservoir to the portion of the site located outside of the former reservoir.

Dormitory A and the Dining Facility are sited over the former reservoir area and are underlain by a 4- to 34-foot thickness of miscellaneous granular fill utilized to fill the former reservoir. In general, the fill material consists of a loose to dense sand and gravel with variable amounts of silt, loam, wood, brick, cinders, asphalt, and boulders. Under the footprint of Dormitory A, the fill is directly underlain both by glacial till, which is plastered on the bedrock surface, and by bedrock. The surface of the glacial till was encountered between 4.5 to 7 feet below the existing ground surface. Bedrock was encountered near the northeast end of the proposed building area, directly underlying the fill at a depth of 3.3 feet below the existing ground surface. The glacial till deposit consists of a dense to very dense deposit of a well-graded mixture of silt, sand, and gravel, which frequently contains cobbles and boulders, and the bedrock underlying the site consists of hard, freshly weathered, moderately fractured to sound Roxbury Conglomerate.

Across the northern portion of the plan area of the proposed Dining Facility, the fill deposit is directly underlain by a deposit of glacial till that is plastered on the bedrock surface. Across the southern portion of the building area, however, the fill material is underlain by successive strata of organics and glacial outwash overlying glacial till and bedrock. In general, the organic deposit consists of soft black peat that increases in thickness from north to south ranging from 0.7 feet to 21 feet. Underlying the peat is a compact to dense deposit of glacial outwash consisting of a medium to fine sand with a trace to some silt. In general, the depth to the outwash deposit and thickness thereof increase from north to south across the southern portion of the proposed dining hall area. Specifically, the thickness of the outwash deposit was observed to vary from approximately 8.5 feet to approximately 21.5 feet. Underlying the outwash deposit, the explorations encountered successive deposits of glacial till and bedrock.

Dormitory B is located at the edge of the former reservoir. This building is benched into the hillside to the north and west and encroaches on Lower Campus Road to the south and east. The subsurface explorations indicate that the building area is underlain by a loose to dense granular fill varying from 2 feet to 5.5 feet in thickness that is directly underlain by a deposit of glacial till. Rock probes performed along the north and west uphill sides of the proposed building area extending to depths of 20 to 26 feet below the existing ground surface did not encounter bedrock.

Groundwater observations in completed boreholes generally indicated the presence of a perched water table on the surface of the glacial till stratum or the bedrock surface across the eastern portion of Dormitory A, as well as in Dormitory B. Across the area of the proposed Dining Facility, groundwater was observed in completed borings at depths about Elevation +136.

Based upon the above subsurface conditions and the scope of the proposed construction, it is proposed to support Dormitory B and the eastern portion of Dormitory A on conventional spread footings bearing on the surface of the dense glacial till. The western portion of Dormitory A and the Dining Facility are proposed to be supported on pressure injected footings (PIFs) founded in the glacial outwash and/or till deposits underlying the surficial spread footings; the lowest level slab is designed as a slab-on-grade, and in areas where the structure is pile supported, the lowest level slab is structurally framed.

Since all of the proposed structures have their lowest level slabs at or slightly above the present site grade and no below-grade space is currently being proposed, the above foundation construction operations are not anticipated to result in adverse movement or settlement of the adjacent ground surface during the construction period. Hence, it anticipated that there will be minimal impact on adjacent buildings and utility lines attributable to the proposed construction. Dormitory B is benched into a sloping site and will therefore require some excavation on its uphill sides. Based upon the elevations of the adjacent structures lowest level slabs and the horizontal distance between the existing structures and the proposed construction, it is anticipated that the required excavation may be open cut.

CONSTRUCTION IMPACTS

Boston College has selected Perini Corporation to construct the dormitories and the Dining Facility. Perini recently completed the science building on the Chestnut Hill campus and is familiar with the site, the surrounding neighborhoods, and local traffic patterns. Perini has prepared a Construction Impacts - Mitigation report for Boston College. This section summarizes the major features of the mitigation plan and offers additional information regarding construction phasing and traffic, and parking impacts.

The construction area is limited to property owned by Boston College. No construction will take place on Commonwealth Avenue, Beacon Street, or College Road. With the exception of minor site utility work at the intersection of St. Thomas More Drive and Lower Campus Road, all construction will occur on the Lower Campus of Boston College as shown on Figure 3-13. All construction-related storage areas will be included within this area.

Construction Phasing

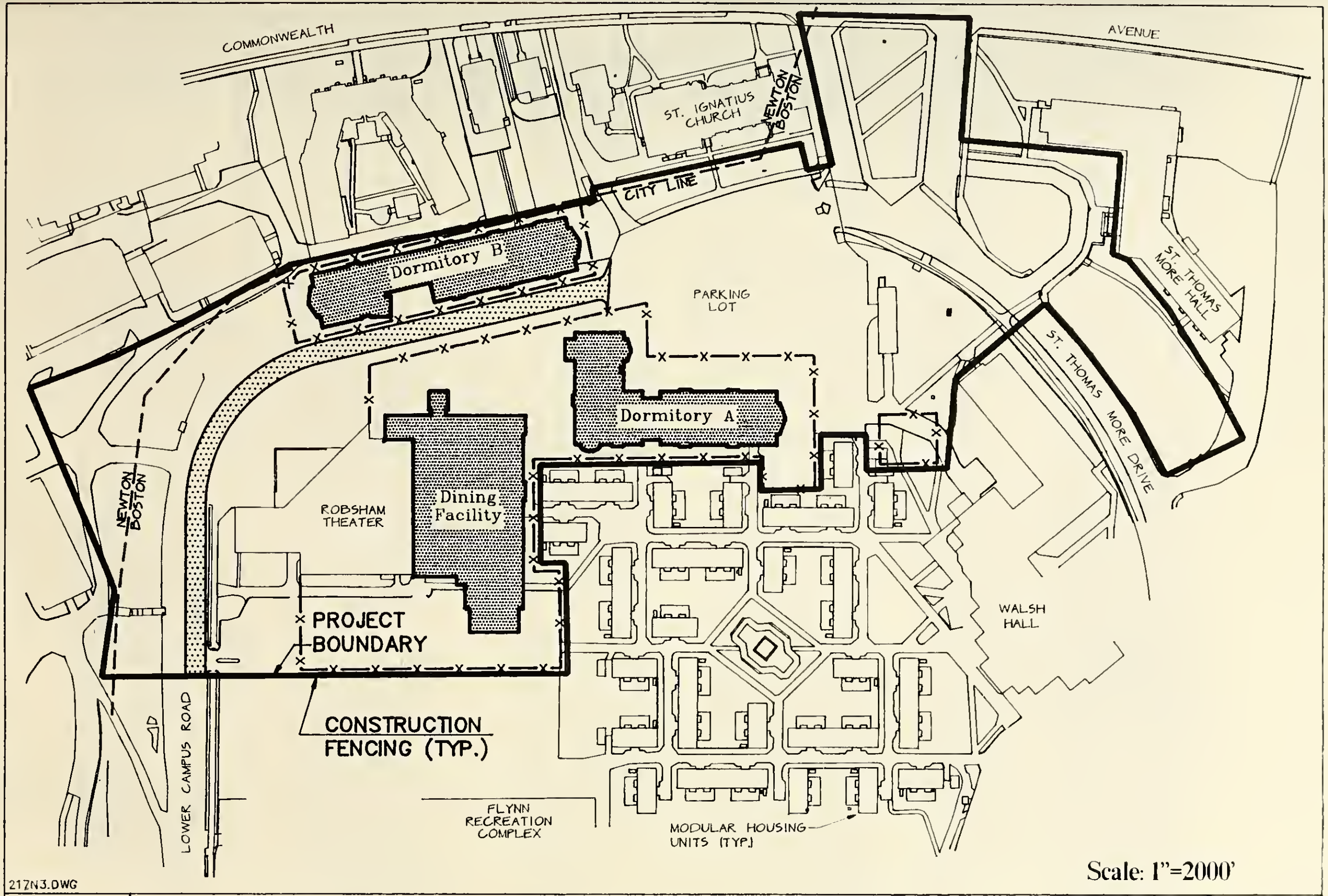
Construction of the two dormitories and the dining facility is anticipated to begin on May 4, 1992 and to end on August 31, 1993. Site utility and earthwork should be complete by October 1992, and the buildings should be secure by March 1993.

Construction-Related Traffic

Construction-related traffic generally includes two components: traffic generated by construction workers and traffic generated by vehicles hauling material in or out of the project site.

Construction Workers. The number of workers required will vary over the construction period. Generally 125 workers will be on site, but during the peak construction period occurring between January and April of 1993, it is estimated that 250 workers will be required.

Based on past experience, Perini estimates that 60 percent of construction workers will drive to work and 40 percent will use the "T". Currently, it is Perini's plan to schedule a 7:30 a.m. to 4:00 p.m. workday. The peak commuting hours along Commonwealth Avenue and Beacon Street occur from 8:00 a.m. and 9:00 a.m. and between 5:00 p.m. and 6:00 p.m. Therefore, traffic generated by construction personnel will not occur during the peak commuting hours. It is anticipated that generally the construction workers will generate approximately 300 new trips daily.



NORTH

LIMITS OF CONSTRUCTION

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure 3-13

Site Vehicles. Perini anticipates that approximately 25 trips will be made to and from the site each day by construction vehicles (deliveries and equipment). These trips will be evenly distributed throughout the work day. Thus, approximately 4 trips to and from the site will occur during the morning peak hour. Truck access to the site will be limited to the gate located on Lower Campus Road, adjacent to Saint Ignatius Church. Trucks will follow a specified route agreed upon with the Boston Transportation Department.

The total increase in vehicle trips to the site due to construction-related activities is anticipated at 350 daily trips, with less than 10 trips occurring during the peak commuting hours. No significant impact to traffic conditions within the Chestnut Hill area will result from the construction of this project.

Traffic circulation on the Lower Campus of Boston College will, however, be significantly impacted. Lower Campus Road, in the vicinity of the project site, will be closed during working hours. Access to and from Lower Campus will be via the gate located between the MDC park and Edmonds Hall. Although this temporary arrangement will be inconvenient for Boston College, it will have to no impact to the nearby intersections of Commonwealth Avenue/Lake Street/St. Thomas More Drive and Beacon Street/Chestnut Hill Drive/Chestnut Hill Road.

During evening hours and during special events, one-way traffic will be permitted on Lower Campus Road. It is recommended that traffic be directed southbound to accommodate entering traffic. Typically, entering traffic is more concentrated than exiting traffic. Thus, traffic would enter Lower Campus at the primary gate adjacent to St. Ignatius and depart at the gate located between the MDC park and Edmonds Hall.

Parking on Lower Campus During Construction

During construction approximately 322 parking spaces will be lost in the Theater lot, St. Ignatius lot, along Lower Campus Road, and along St. Thomas More Drive Hall Circle. However, major mitigation measures, summarized in Table 3-1, are planned by Boston College to offset the loss of these parking spaces. A total of 495 new spaces will be made available during construction. Thus, a net increase of 173 spaces results. This increase in spaces will be made available to the 125 workers constructing the project.

Construction Mitigation (Noise, Traffic, Air, and Pedestrian)

Construction mitigation procedures as described in the Perini report are summarized in Table 3-2. Particular sensitivity will be given to minimizing impacts to St. Ignatius Church. St. Ignatius Church is located at the corner of Lower Campus Road and Fr. Herlihy Drive. Construction will be limited to weekdays to the extent possible; church parking will be preserved, and the church will be regularly informed of construction plans and their timing.

TABLE 3-1

PARKING MITIGATION MEASURES DURING CONSTRUCTION

Restriping of existing Lower Campus parking areas	50 spaces
Resigning of St. Thomas More Drive to permit parking for construction workers	60 spaces
Widening of St. Thomas More Hall Circle	15 spaces
Reduction of parking permits	50 spaces
Modifications of project's landscaping component	70 spaces
Off-campus parking lots with shuttle service to and from campus (Parking lots will be located on Hammond Pond Parkway and Soldier's Field Road)	250 spaces
Total Replacement Parking During Construction	495 spaces

RODENT CONTROL

The responsibility for implementation of rodent control is assigned to the Boston College Housekeeping Department. They are responsible for the existing "Integrated Pest Management Program" at Boston College and employ a licensed in-house technician for internal control and monitoring.

The interior of the buildings are routinely inspected for raccoons, skunks, and other rodents and, if found, are treated in accordance with the Massachusetts State Laws, Health Codes, and any applicable local ordinances.

Areas of new construction are surveyed for pest and rodent activity. A report is submitted and upon its subsequent review, a determination for action (or no action) is made. Should a potential problem be noted a course of action is selected as follows:

a. Minor Activity and/or Small Site - The work is assigned to the in-house technician for abatement and monitoring throughout the project duration.

b. Significant Activity and/or Large Site - The work is scoped by in-house personnel and priced by licensed corporations. The work is then accomplished through contract services and is overseen by in-house personnel.

Typical pretreatment steps during construction are as follows:

a. Emphasize that workers are to be "proactive" in regard to proper disposal procedures for all rubbish, trash, and food products (lunch) in order not to attract pest or rodents to the construction site.

TABLE 3-2

CONSTRUCTION MITIGATION MEASURES

Noise	Work will generally occur between 7:30 a.m. and 4:00 p.m. Overtime needs will first be met by extending the workday to 5:00 p.m. Trucks will not be permitted to idle longer than 15 minutes.
Traffic	Construction workers will regularly be encouraged to use public transportation to and from the site. Truck activity will be minimized during peak hour traffic hours (7:30 a.m. to 9:00 a.m. and 4:00 p.m. to 5:00 p.m.). In the immediate area, deliveries will be restricted to Beacon Street, Commonwealth Avenue, and St. Thomas More Drive. Trucks will not be permitted on local residential streets. No double parking or traffic obstruction will be permitted by construction vehicles. Prior to construction of the project, a Construction Traffic and Staging Plan will be prepared. The plan will be a contractual obligation for all subcontractors and suppliers working on the project.
Dust	Dust-generating debris will be wetted. Storage of debris on-site will be minimized. Trucks hauling debris from the site will be covered. Dust-covered streets and sidewalks will be periodically cleaned.
Pedestrian Protection	A chain link fence will be placed around the perimeter of the project area. Walkways will be provided for pedestrians. Appropriate signage will be provided for pedestrian routing around the work area. Campus police will make security checks at least twice a night to ensure the site is secure.
Communications	There will be a designated representative for Boston College who will respond to any concerns regarding construction issues.

b. Empty construction dumpsters on a regular and frequent basis.

c. Pretreat soil under slab on grade construction, as required.

d. Pretreat wall/partition cavities and mechanical shafts as they are constructed, prior to being closed.

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CHAPTER 4

URBAN DESIGN COMPONENT

DESIGN CONCEPT

Boston College was founded by the Society of Jesus in 1863 in Boston's South End. By 1907 the College, needing to expand, purchased four parcels of land in Chestnut Hill on what is now called the Middle Campus. Gasson Hall, completed in 1913, was the first building on the campus. The remaining academic buildings on Middle Campus were constructed largely in a Gothic style.

A student residential community began at Boston College in the middle of the 1950s with the construction of housing on the recently purchased Upper Campus. Between 1955 and 1965, the Upper Campus saw the acquisition of a dozen residence halls, all executed at the low scale of the surrounding suburban homes. The College also purchased the property comprising Lower Campus in the 1940s; with the exception of the Alumni Stadium, the Roberts Basketball Center, and the McHugh Jr. Hockey Arena, this land was undeveloped until the end of the 1960s.

Since that time, the Lower Campus has seen the development of the Robsham Theater, the Conte Forum, and the parking garage. The Thomas P. O'Neil Jr. Library, constructed in 1984, begins the transition between Lower and Middle Campus. The future campus center is intended to complete this link. Boston College also commissioned a Lower Campus Planning Status Report in 1985 and a Campus Wide Site Identification Study in 1987. These studies identified future building projects and options for potential sites. Designated projects included a new recreation complex to replace the existing one, playing fields, a fine arts center, a garage, a campus center, a dining facility, and dormitories.

Boston College currently faces severe shortages in its ability to provide on-campus housing and dining for the great percentage of students requesting those services. The proposed Housing and Dining Facilities Project would begin to address this demand, as well as serve to unify the College's Lower Campus.

The Project comprises two dormitories and a dining facility. One residential building would occupy part of the current St. Ignatius parking lot adjacent to the lower campus entry. This building is approximately 115,000 square feet (SF) in size and will house 380 students and 11 supervisory personnel. A second structure would be built into the hillside directly behind the U-shaped dormitory at 66 Commonwealth Avenue, thereby completing that courtyard. This building encompasses 110,000 square feet and will provide 354 student beds and 11 beds for Resident Assistants and a Hall Director. The new 50,000-square-foot dining facility would adjoin the Robsham Theater and provide 800 seats to serve approximately 2,000 students at a peak meal period.

Siting of these buildings was also considered critical to the greater goals of the Boston College Master Plan. As presently configured, the entry to the Lower Campus lacks the definition and the "sense of arrival" of the Middle Campus. As currently designed, these new buildings, along with the architecturally significant St. Ignatius Church, would frame the Lower Campus entry and form a courtyard. The configuration of Dormitory A further emphasizes this passageway and defines a paved plaza in front of the Dining Hall. This plaza, which adjoins and extends into the existing Robsham Plaza, provides a Lower Campus space for informal gatherings and programmed activities.

The existing campus buildings surrounding the Project present a variety of architectural styles and massings. Walsh and Edmonds Halls, southeast of the site, are modern buildings, predominantly eight stories in height. Robsham Theater, which adjoins the new Dining Facility, is also a modern brick structure with a fly loft extending 65 feet above the ground plane. The north and west sides of the site are defined by Lower Campus Road and the hillside that leads up to the Gothic-style Middle Campus. The rooftops of the buildings on the hill sit significantly above the proposed site, shielding views of the project from Commonwealth Avenue.

The two dormitories will be six stories in height, approximately equal to the Robsham fly loft and several stories shorter than Walsh and Edmonds Halls. The Dining Facility will be two stories, with an approximate height of 35 feet high at the eaves. The facade is broken with bays. The largely flat roofs are articulated with peaked sections at significant areas of the buildings. These features reduce the perceived mass of the structures, provide a more residential scale and bridge the stylistic differences with the surrounding buildings.

The surface materials are also largely similar to those of Robsham Theater. The lower base courses of brick will match the theater, while the tile of the Robsham entry will be incorporated into bays and recessed panels. A second brick, yet to be finalized, will be used for upper stories in the dormitories.

PROGRAM

The residential component of the project is divided into two buildings: Dormitory A and Dormitory B. The dormitories comprise suite-style units housing 8, 6, or 4 students. Each dormitory provides one or two units for Resident Assistants (RA), for supervisory purposes, with an overall maximum ratio of one RA per 38 students. Additionally, each building includes a ground floor unit to house either a Hall Director or Jesuit Resident providing an adult presence in each dormitory.

A small study area is provided on most floors to give students an alternative environment for school work. Lounges for socializing occur in various locations throughout the new buildings, with a large function room and game room in Dormitory A that overlook the plaza outside of the new Dining Hall. A summary of the program for the dormitories is presented in Table 4-1.

TABLE 4-1

PROGRAM FOR DORMITORIES A AND B

Component	**Dormitory A** **330 Students** **118,033 SF**	**Dormitory B** **356 students** **109,719 SF**
8-person suites	5 @ 1,550 SF	10 @ 1,550 SF
6-person suites	35 @ 1,600 SF	27 @ 1,600 SF
4-person suites	8 @ 1,360 SF 3 @ 905 SF	15 @ 905 SF
RA units	10 @ 650 SF	9 @ 490 SF
Jesuit Hall Dir. Apartment	1 @ 1,025 SF	1 @ 885 SF
Study Lounges	3 @ 330 SF	1 @ 200 SF
Building Lounge	1 @ 1,150 SF	3 @ 490 SF
Lobby	1 @ 990 SF	
Multi-Purpose Room	1 @ 3,915 SF	
Game Room	1 @ 2,450 SF	
Multi-Purpose Vestibule	1 @ 275 SF	
Catering Kitchen	1 @ 500 SF	
Laundry	1 @ 260 SF	1 @ 270 SF

The Dining Facility is designed for 800 seats on two levels and offers students food from two different serveries. The main "scramble style" servery and kitchen areas on the ground floor provide for large dining capacity, while a pizzeria on the second floor offers italian specialties and late-night dining opportunities. Special function rooms are also located on the second floor. Catering of the function rooms will be out of the main kitchen.

A detailed list of these spaces and their associated square footage is contained in Table 4-2. The Dining Facility will consist of 50,858 gross square feet (GSF): 31,174 on the first floor and 19,684 on the second floor. The floor area includes 33,880 net square feet (NSF).

TABLE 4-2

PROGRAM FOR DINING FACILITY

Dining		Lockers/Toilet	
First Floor Dining	7,095 SF	Staff Lockers and Staff Toilets	485 SF
Second Floor Dining	4,830 SF		
Kitchen		Servery	
Hot/cold product	2,450 SF	Main Servery	4,026 SF
Walk-in Refrig.	505 SF	Pizza/Pasta Parlor	900 SF
Walk-in Freezer	336 SF		
Office		Receiving/Trash	
Manager	130 SF	Receiving/Break-out	100 SF
Receiving Office	85 SF	Washdown Room	100 SF
Production Manager	100 SF	Trash Room*	207 SF
Asst. Mgr./Supervisors	195 SF		
Dish/Potwashing		Function Facility	
Dishwashing	816 SF	Function Room	3,315 SF
Potwashing	216 SF	Meeting Rooms	1,250 SF
		Lobby	1,360 SF
		Network Services	300 SF
Storage		Table/Chair Storage	700 SF
		Set up/Catering Space	1,000 SF
Bulk Dry	1,032 SF	Coat Room	360 SF
Utensil/Catering	60 SF	Service Corridor	996 SF
Cleaning Supplies	326 SF	First Floor Stair Lobby	200 SF
Linens and Uniforms	105 SF		

VISUAL DOCUMENTATION

To further clarify the design intent of the Project, the following figures at the end of this chapter contain visual documentation of the existing campus, neighborhood, and proposed design concept. These plans and photographs demonstrate the positive effect the Project will have on the organization of the Lower Campus and the minimal visual impact on off-campus neighbors.

The originals of this material as requested in the Scoping Determination at the appropriate scale are submitted separately.

Appendix C contains prior designs for the Project.

Two models are available for viewing at the offices of Perry Dean Rogers & Partners. The first, a site model at a scale of 1" = 60′, depicts the larger context surrounding the project. The second, 1/8-inch scale elevations of the facades facing the "Plaza," presents a more detailed view of the building design.

Design development materials will be available for submission April 15, 1992 or within two weeks of acceptance of the Schematic Design.

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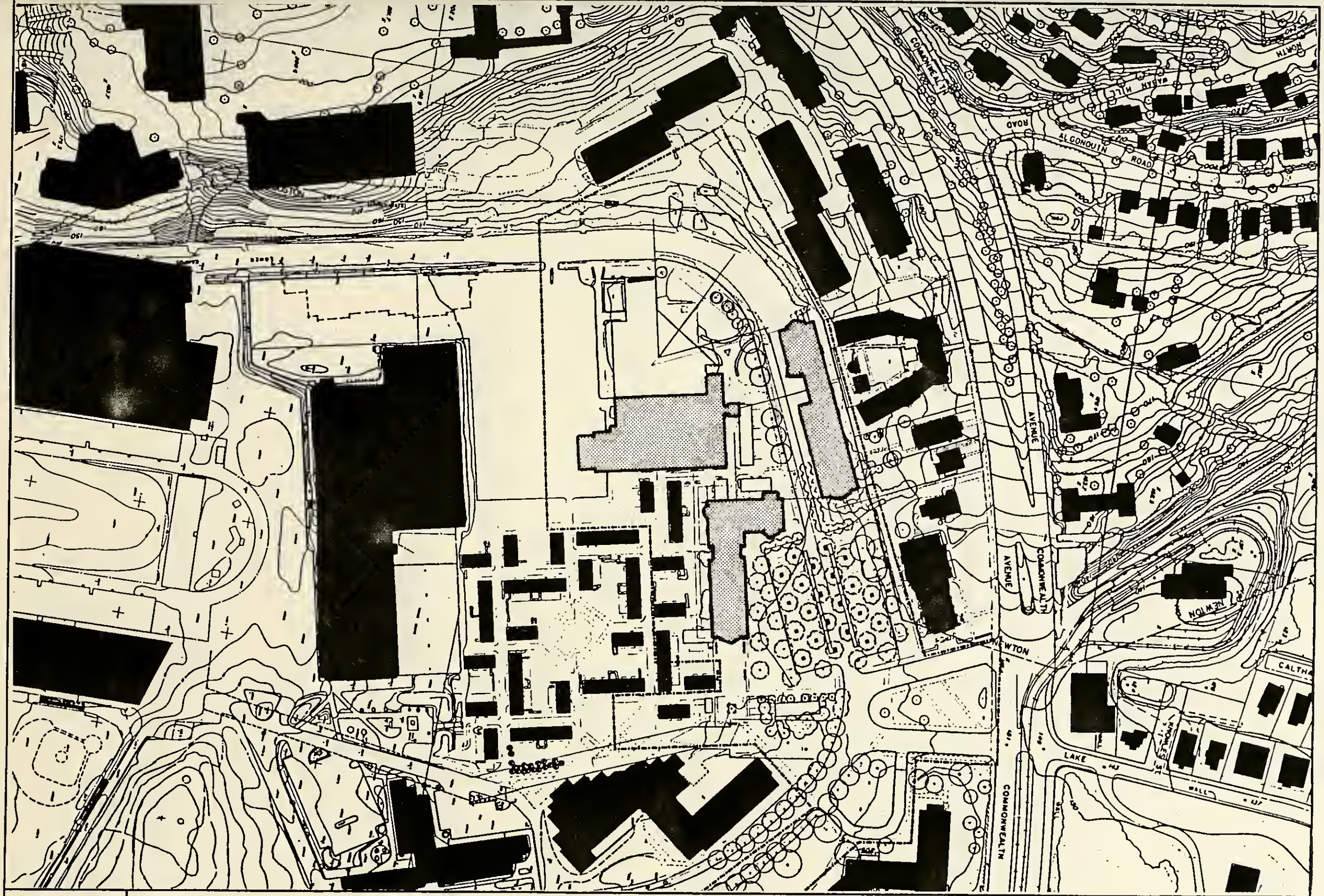
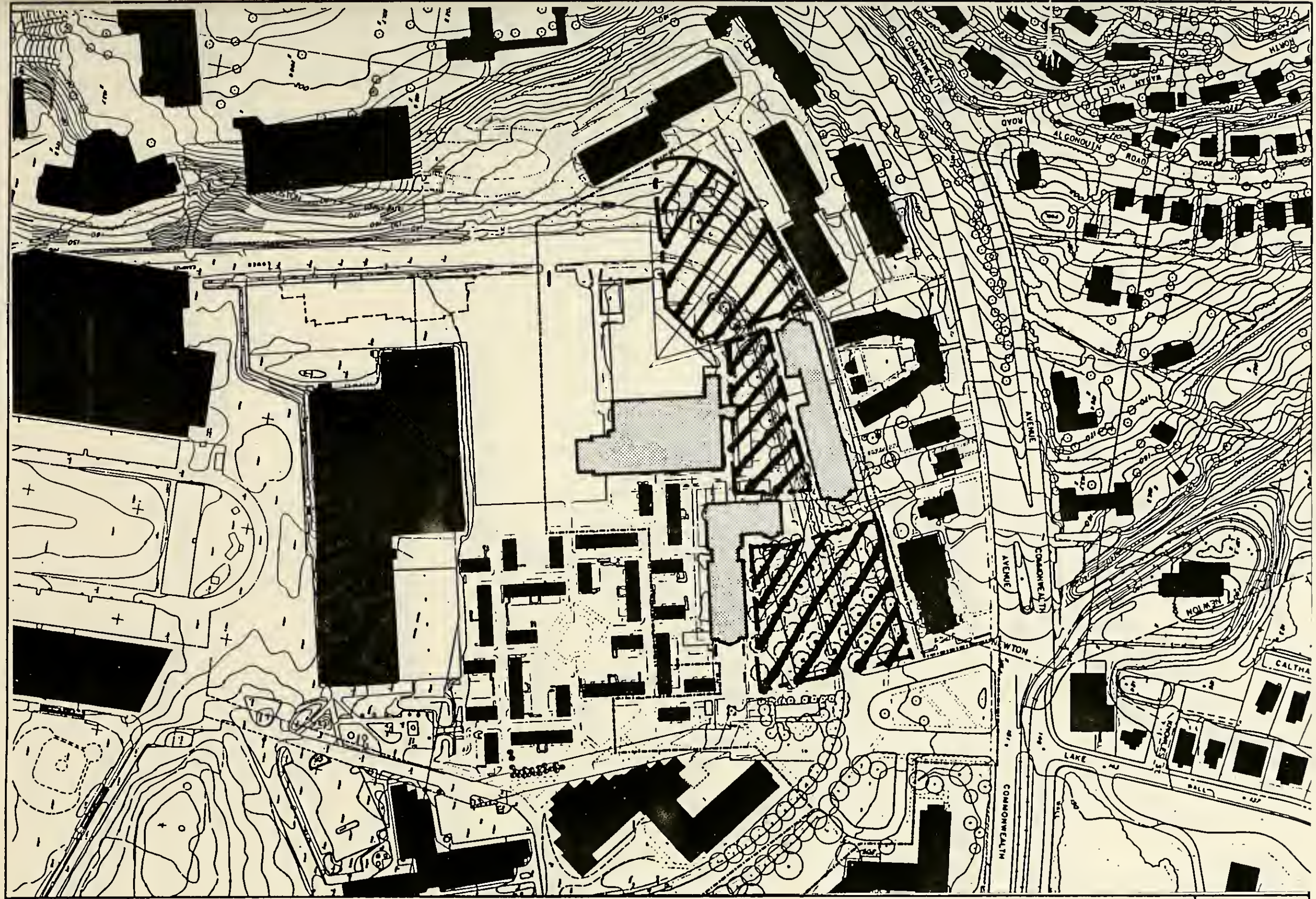


AREA /DISTRICT SITE PLAN

BOSTON COLLEGE: LOWER CAMPUS PROJECT

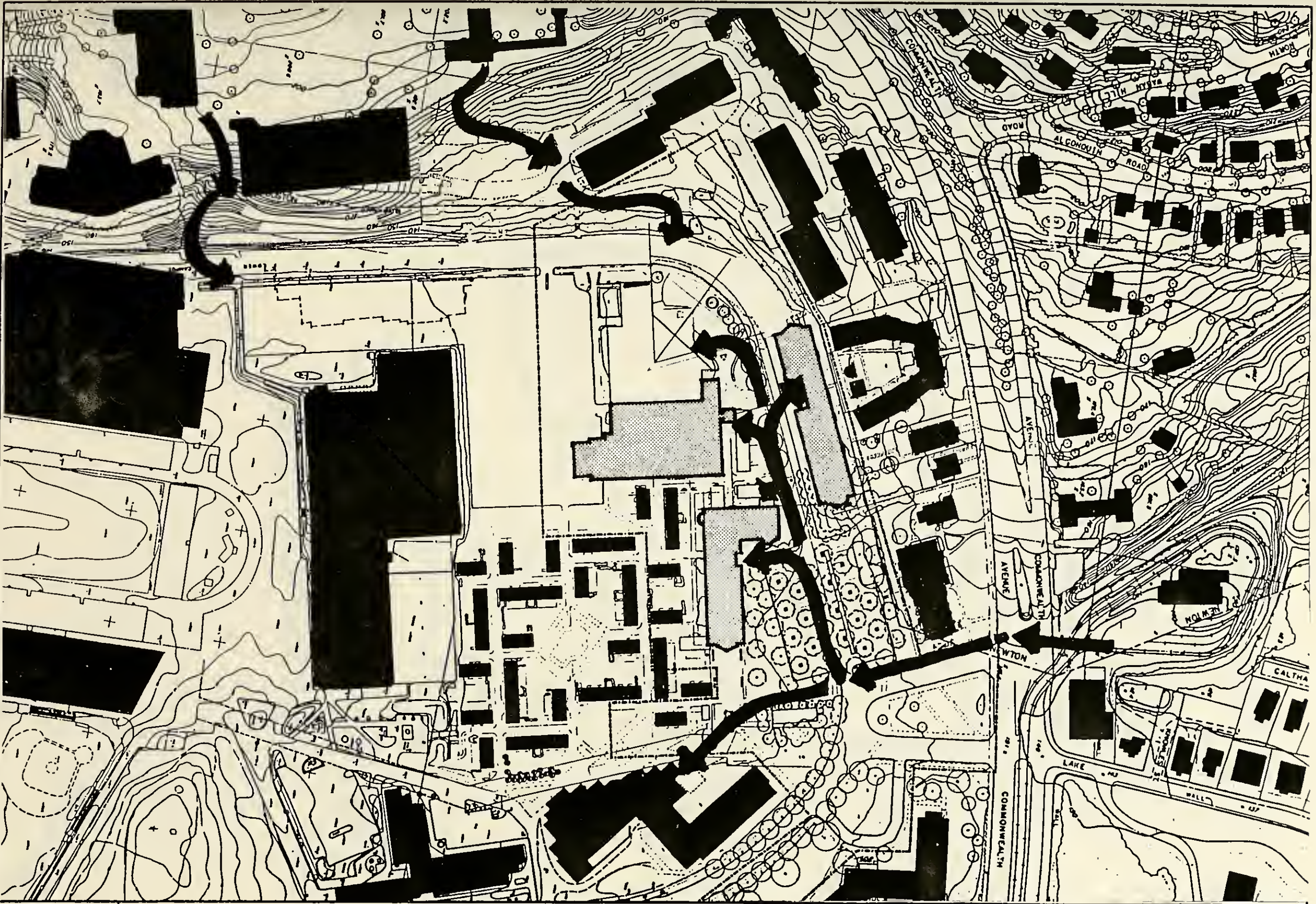
Figure
4-1



OPEN SPACE
AREA /DISTRICT SITE PLAN

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure
4-2

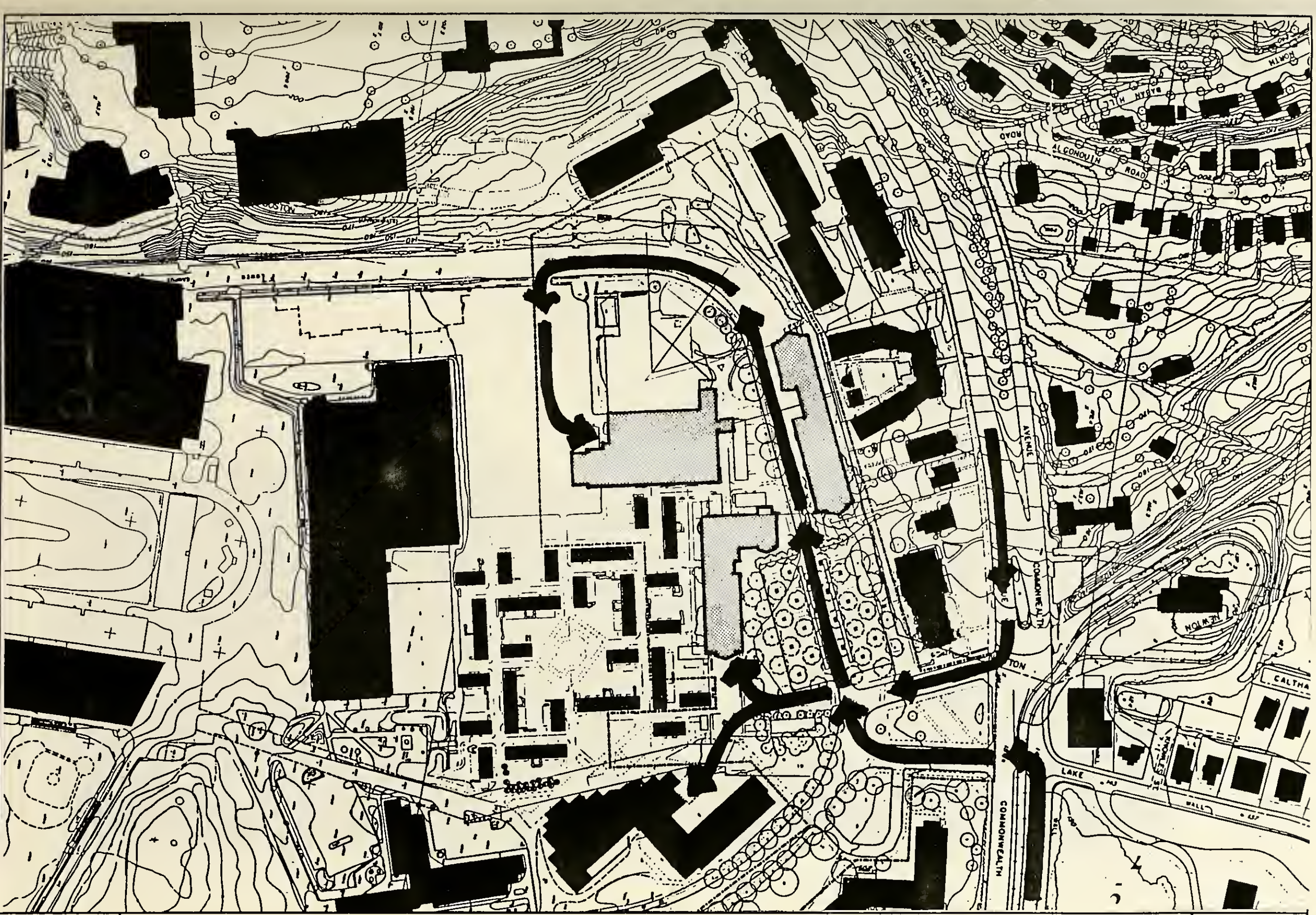


NORTH

PEDESTRIAN CIRCULATION
AREA /DISTRICT SITE PLAN

BOSTON COLLEGE: LOWER CAMPUS PROJECT

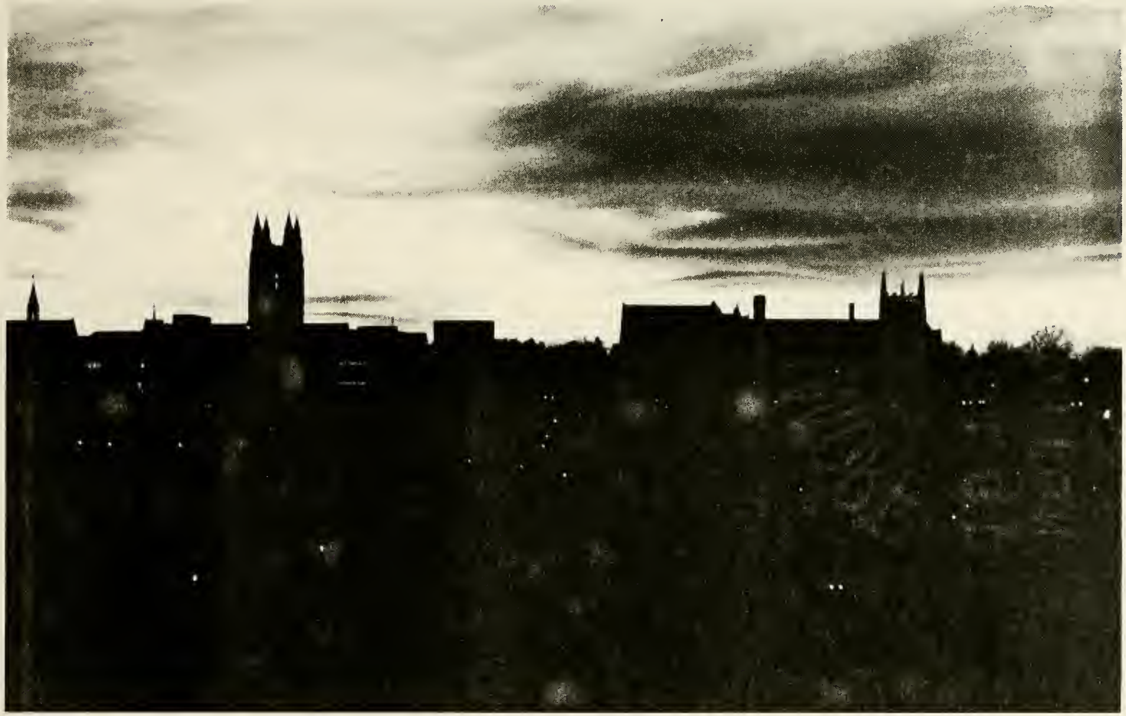
Figure
4-3



VEHICULAR CIRCULATION
AREA /DISTRICT SITE PLAN

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure
4-4

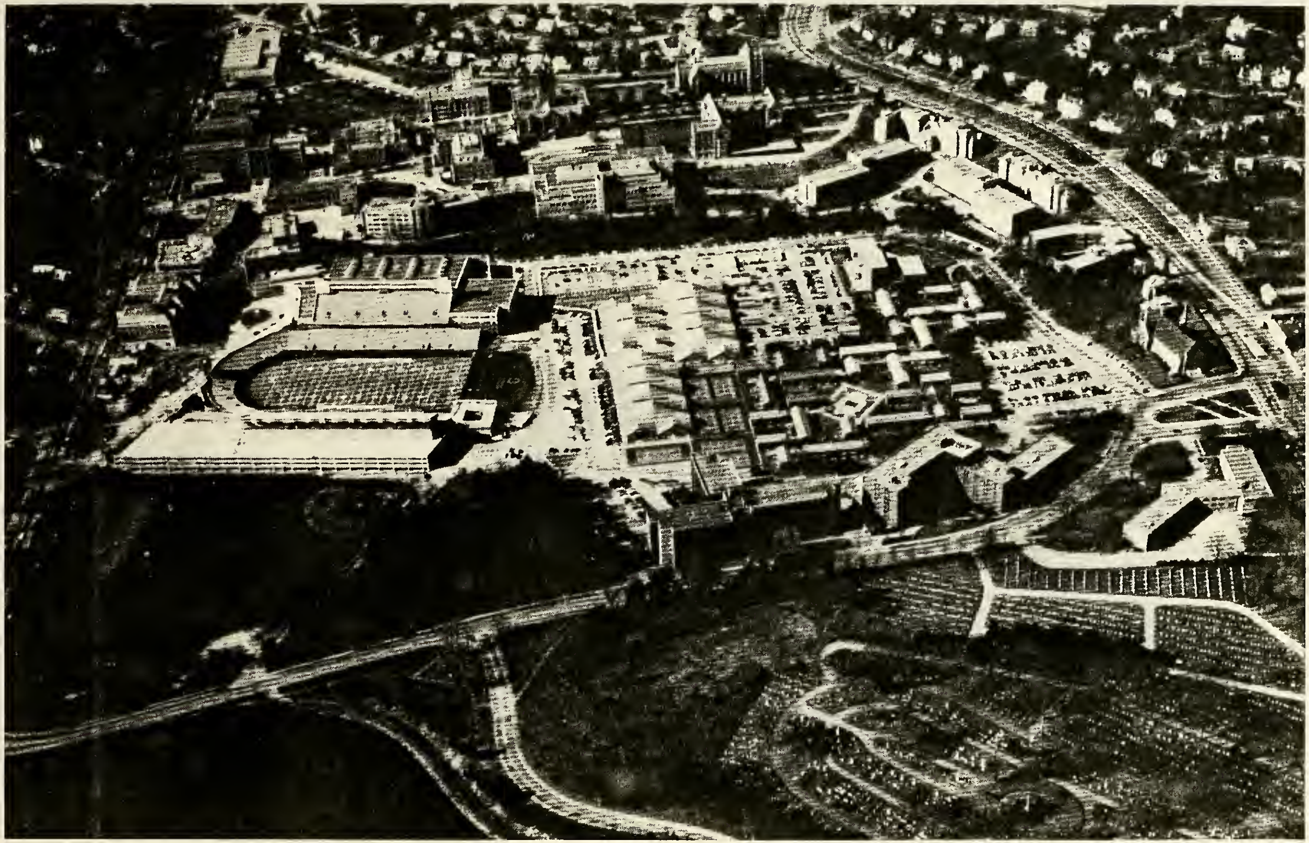


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-5

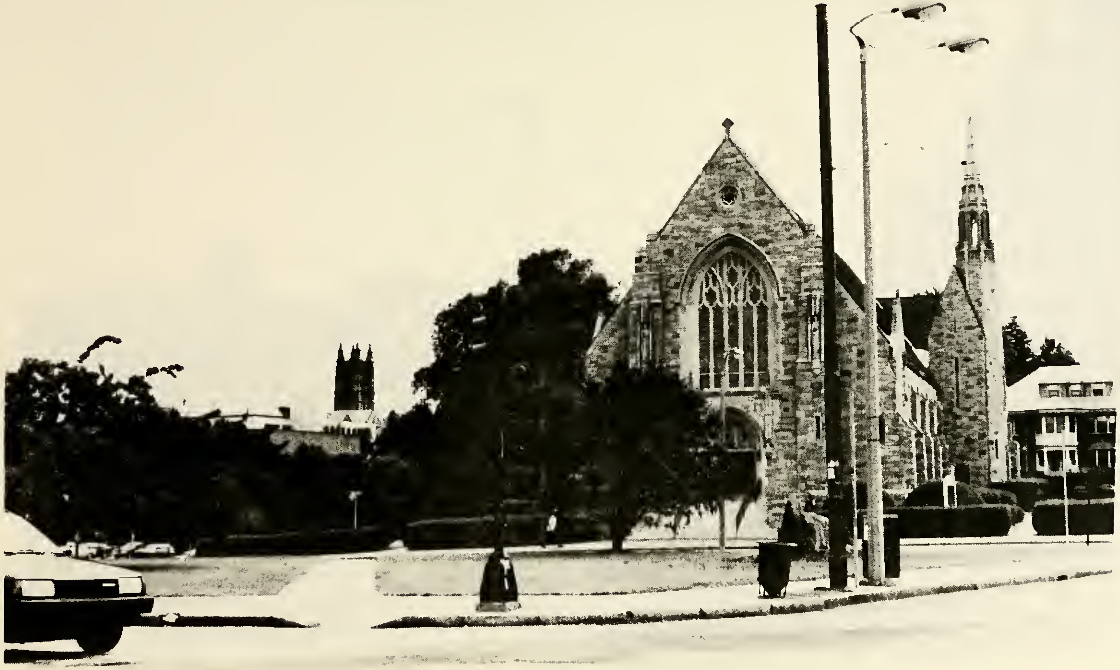


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

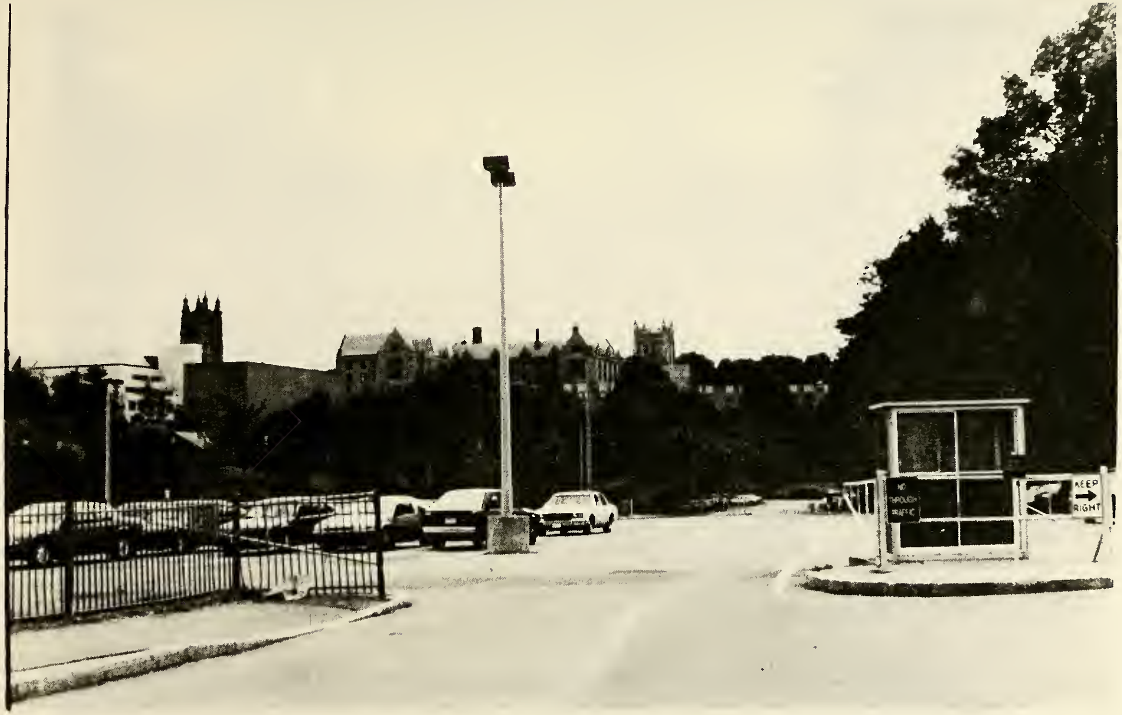
Figure

4-6



CONTEXT: SITE AND NEIGHBORHOOD IMAGES
BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure
4-7

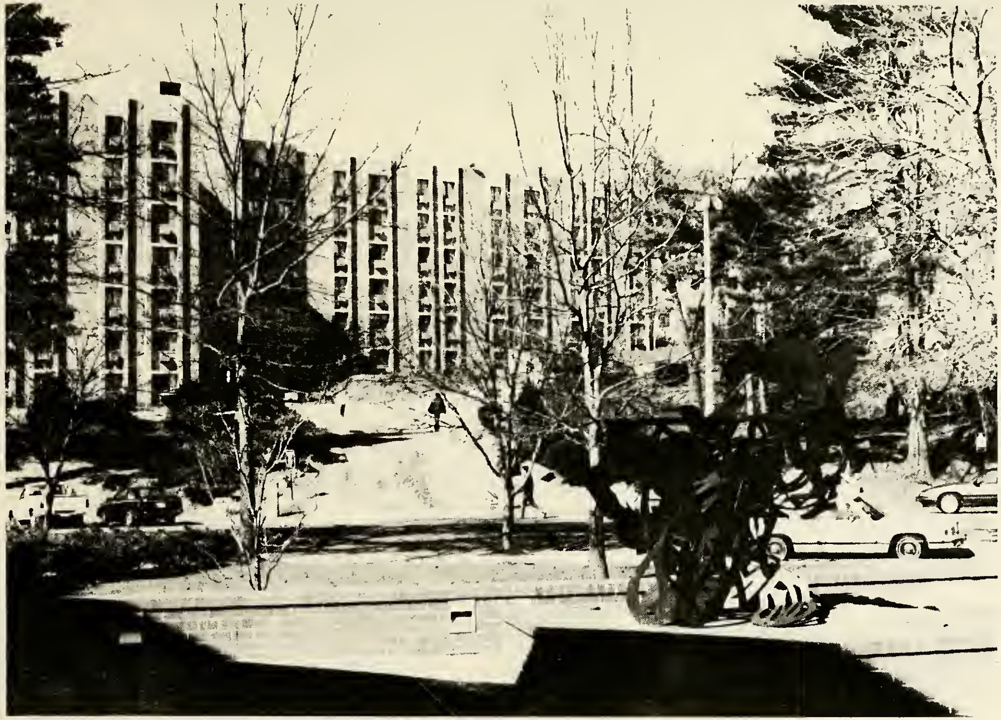


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-8

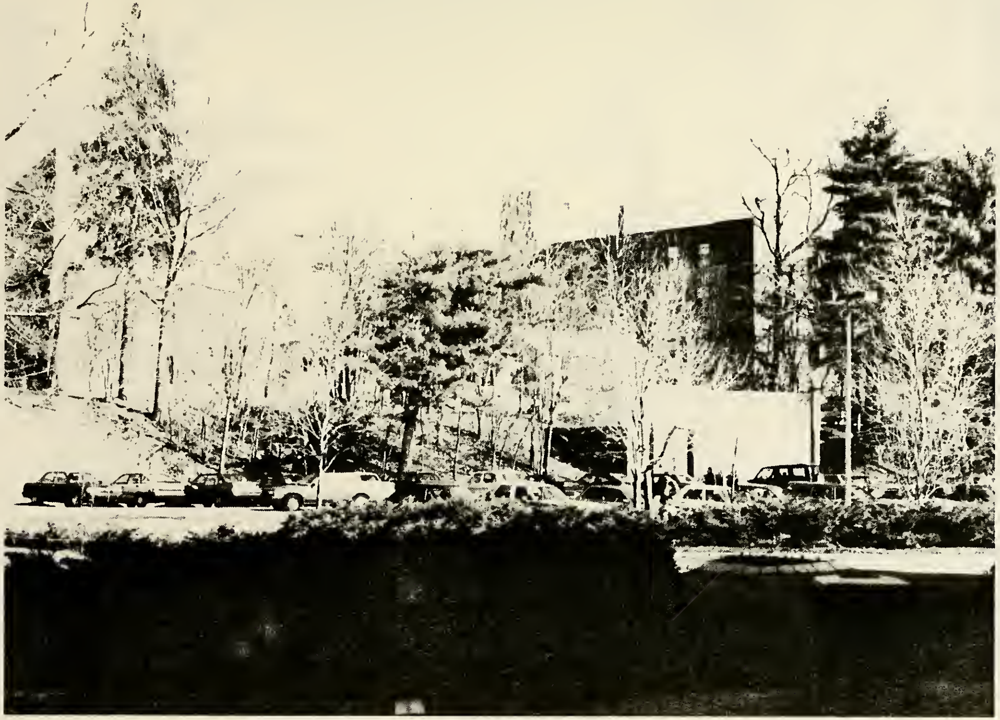


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-9

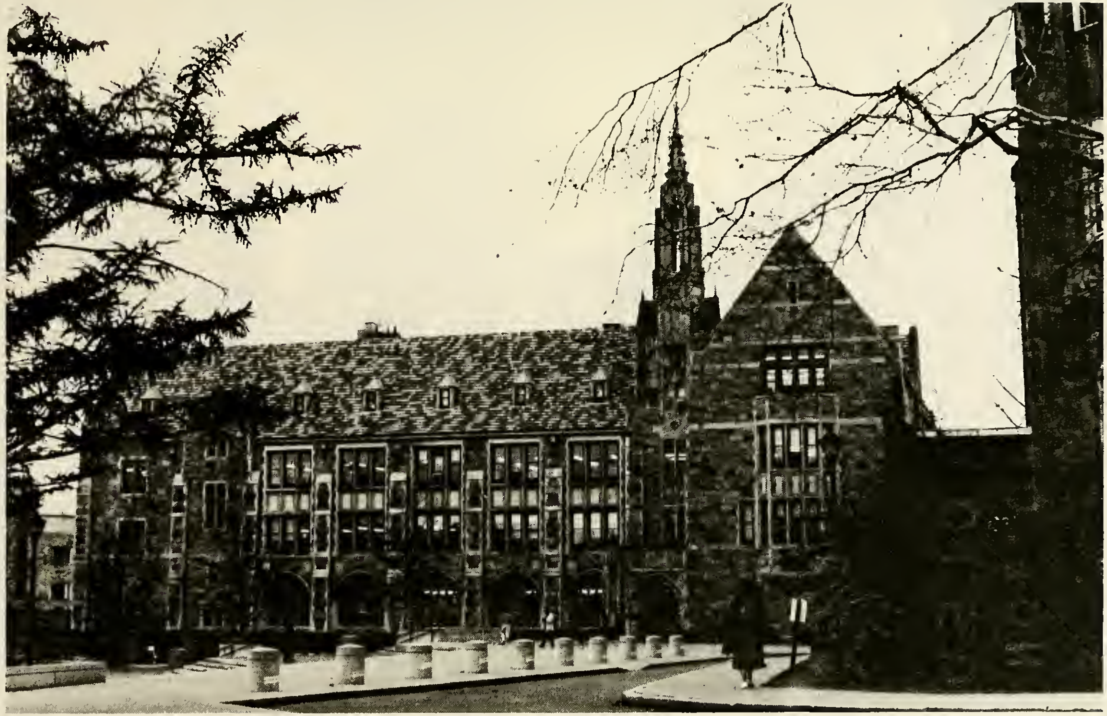


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-10

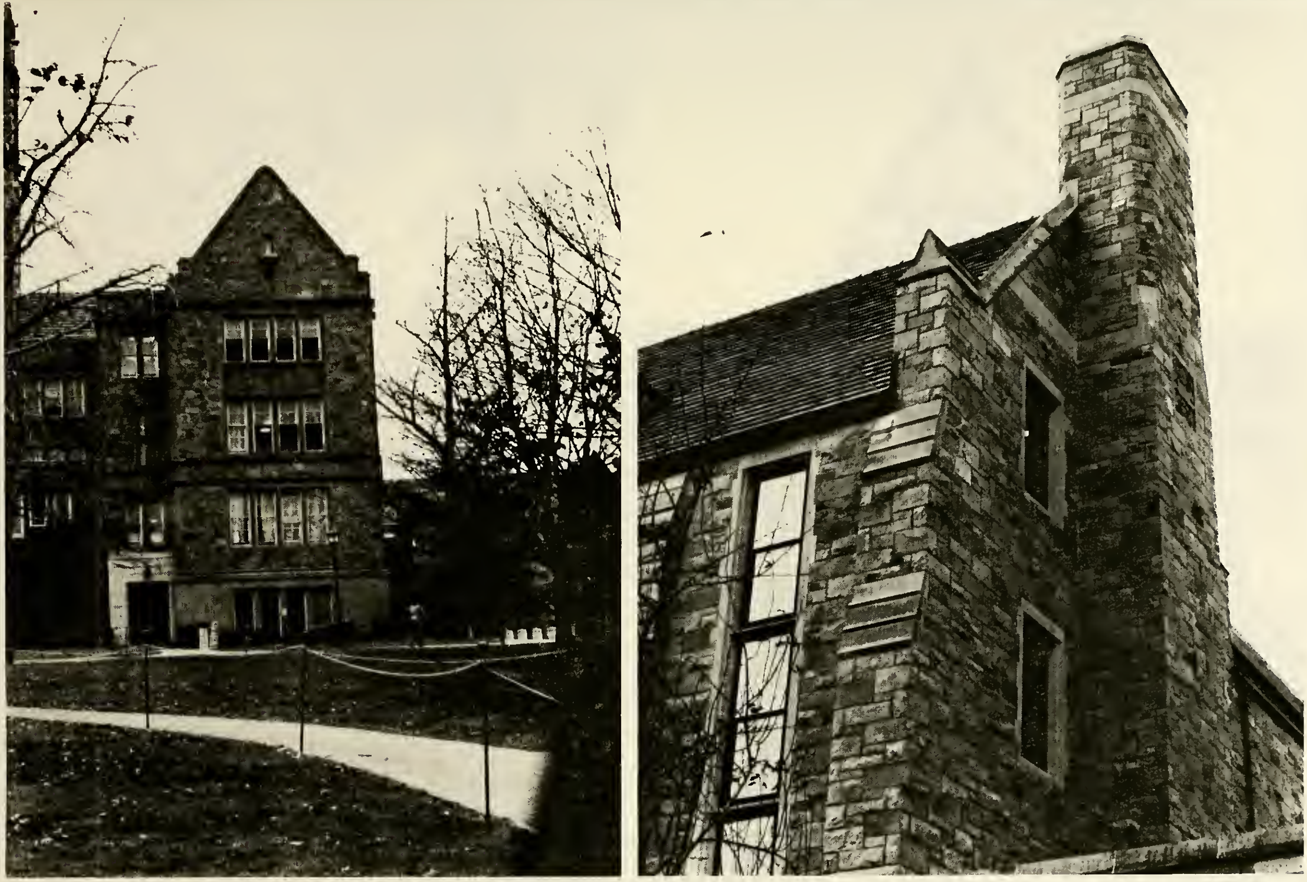


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-11

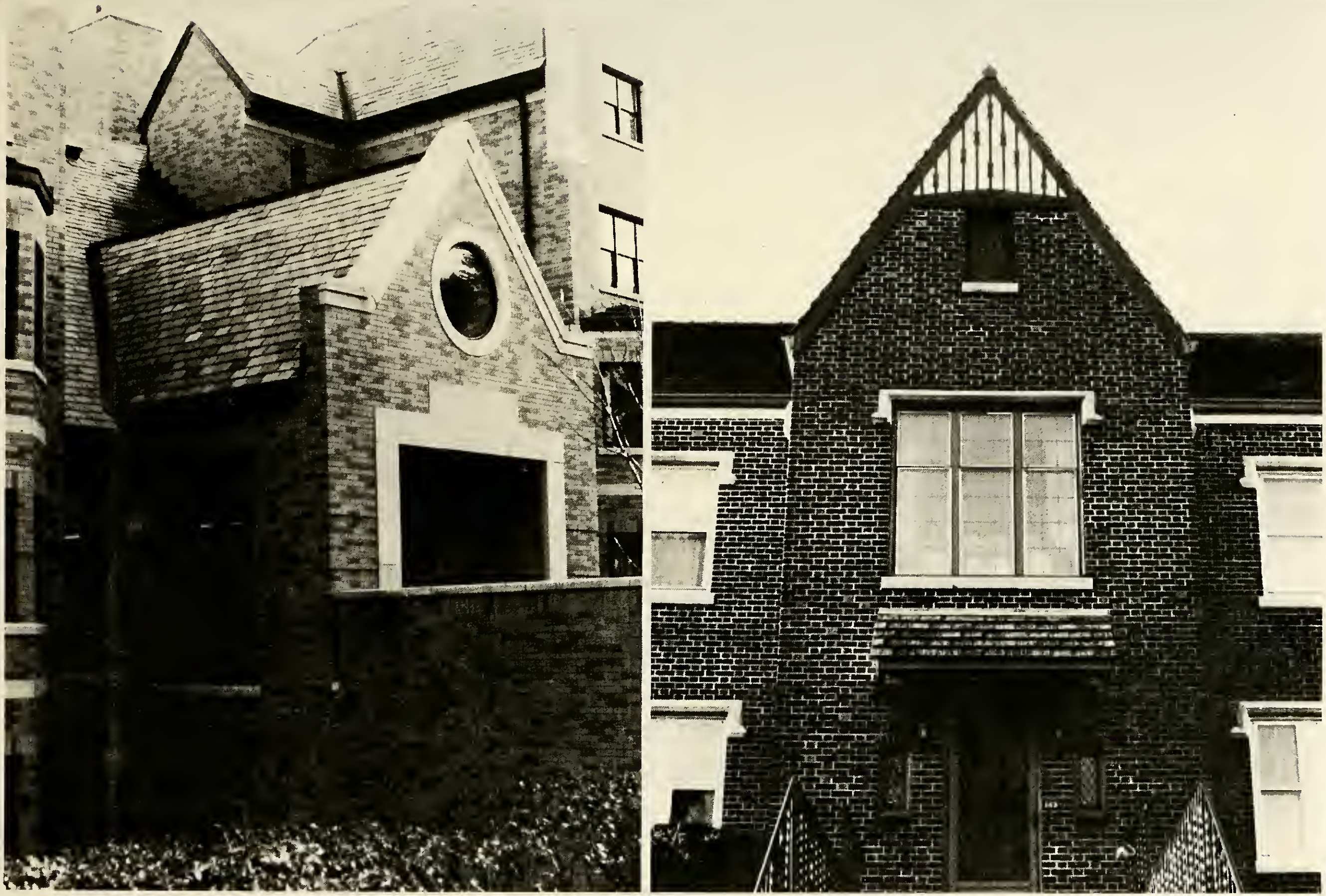


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-12

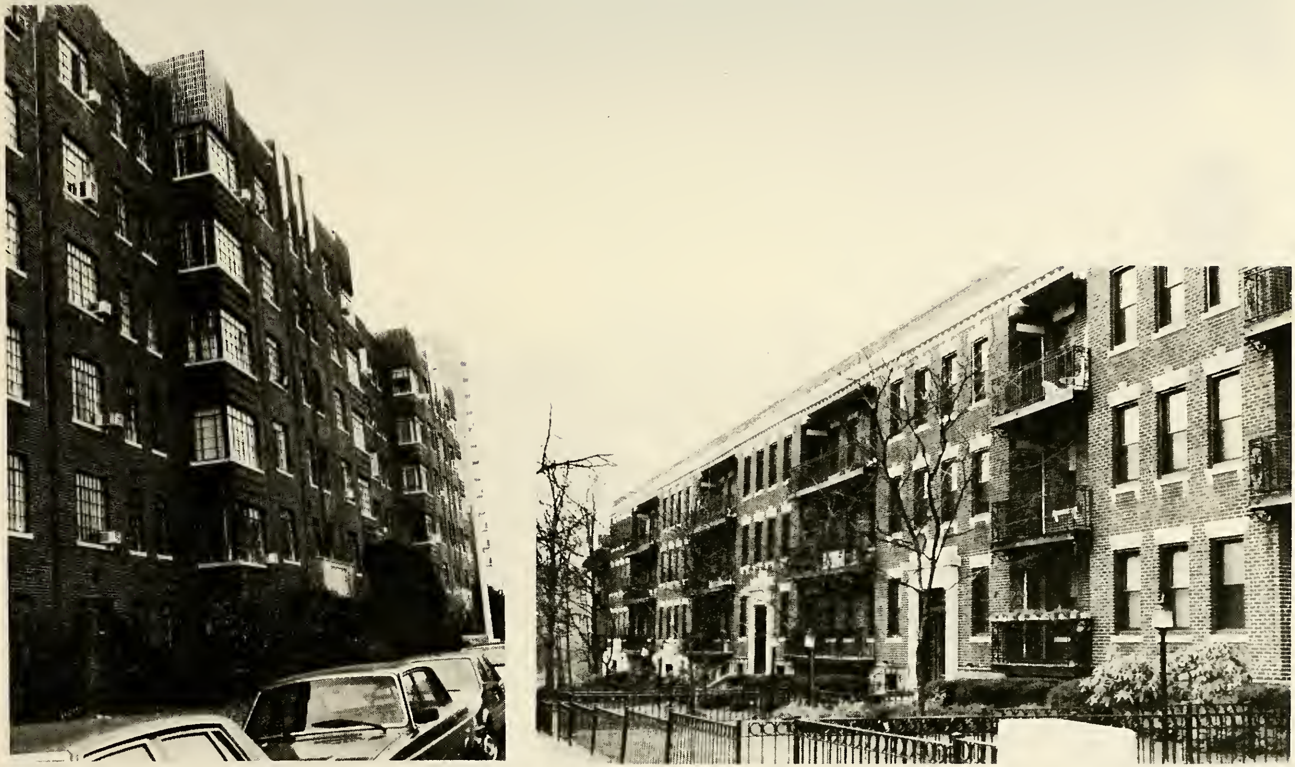


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-13

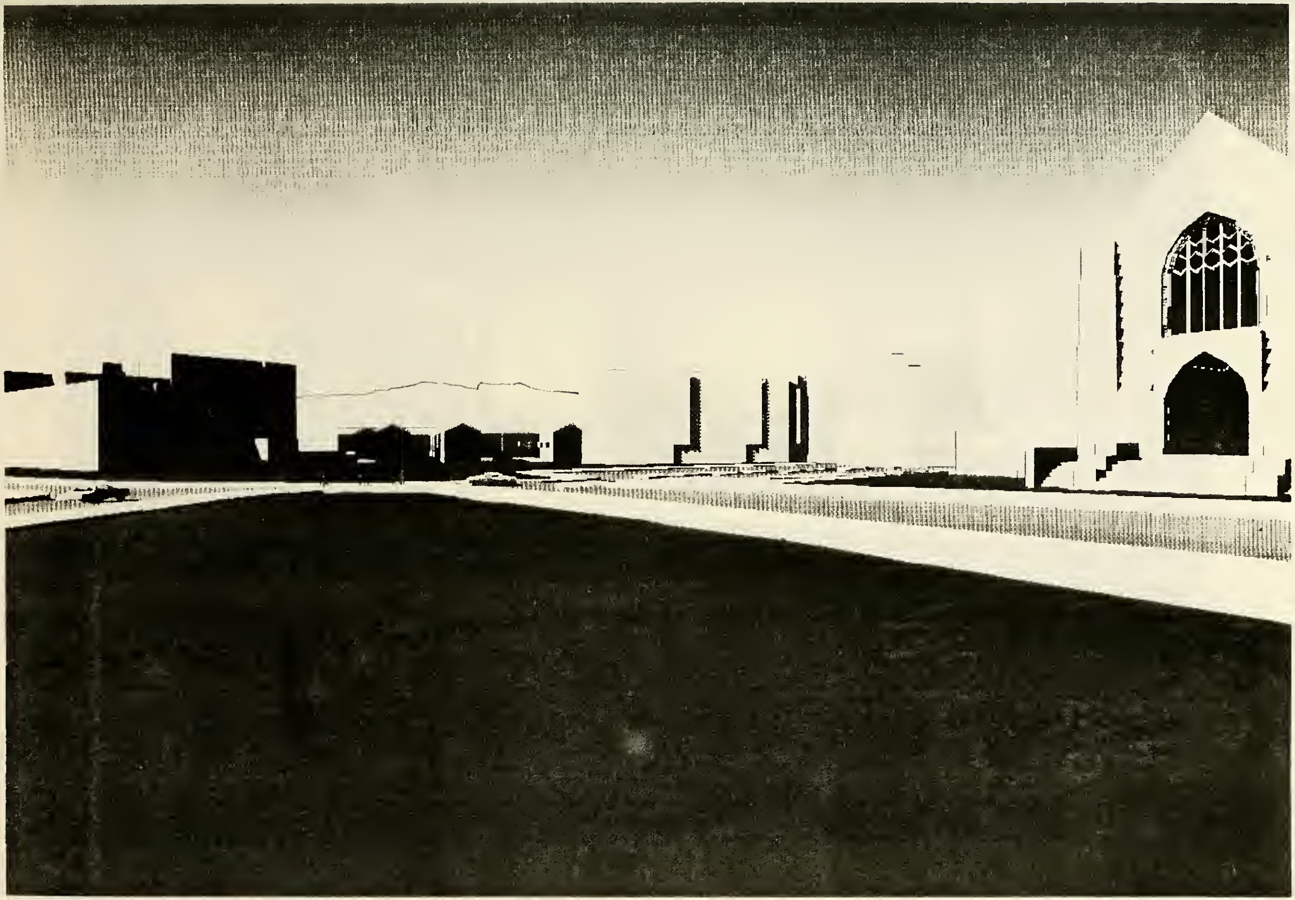


CONTEXT: SITE AND NEIGHBORHOOD IMAGES

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-14

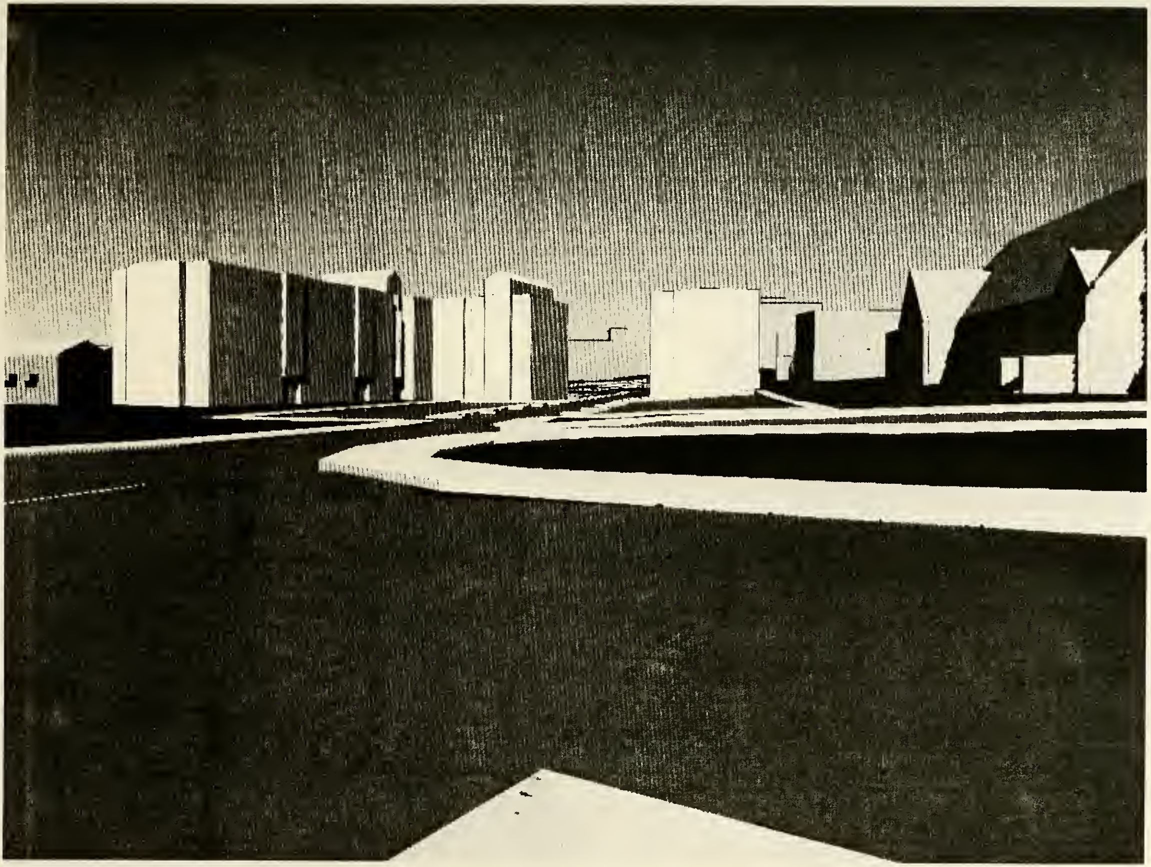


VIEW FROM COMMONWEALTH AVENUE LOOKING TOWARD MODULAR HOUSING

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-15

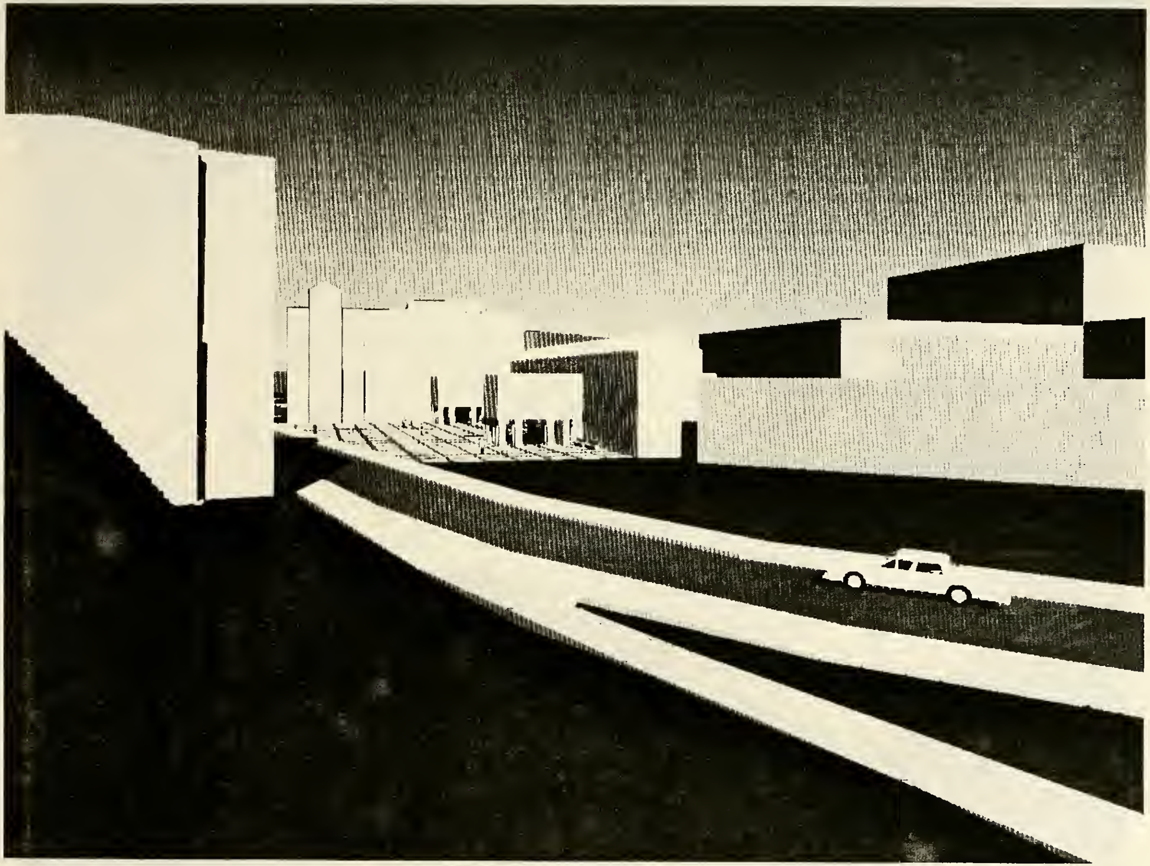


VIEW FROM THOMAS MORE HALL LOOKING WEST

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-16

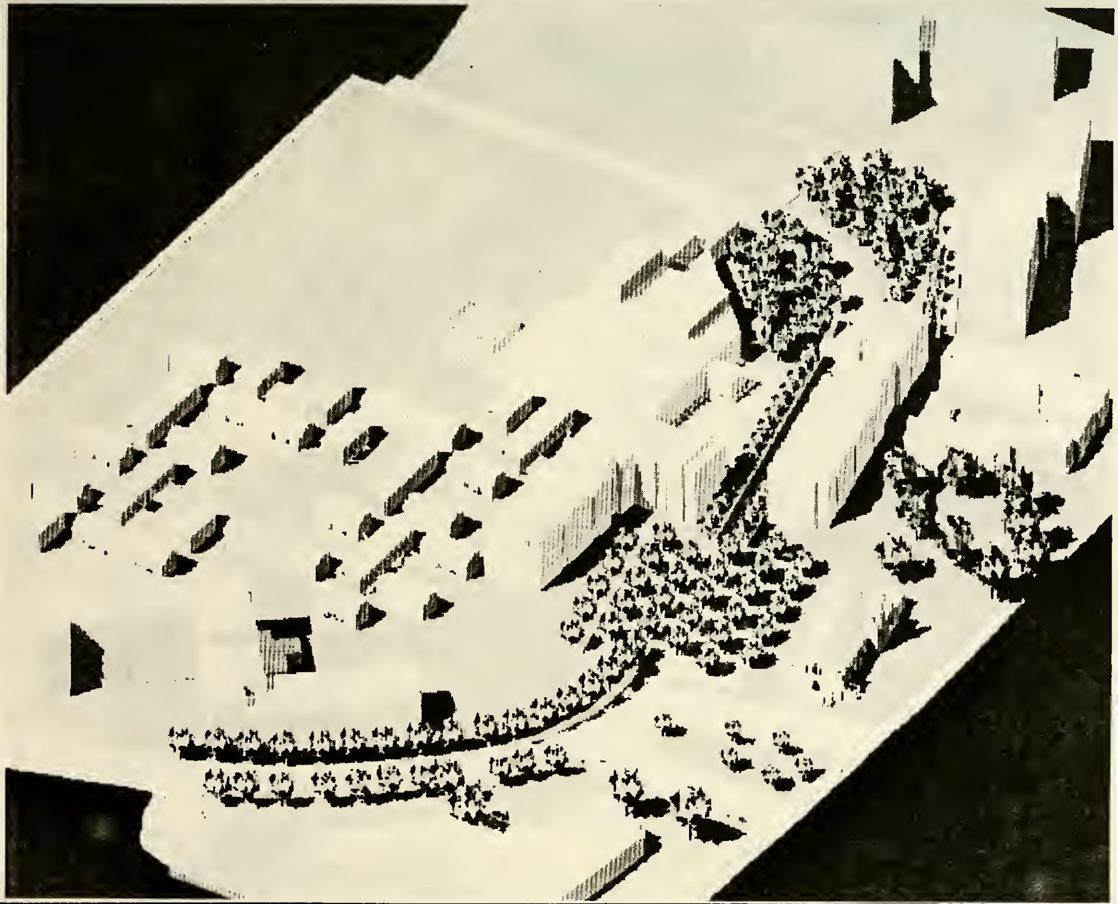


VIEW FROM THE HILLSIDE LOOKING TOWARD THE PLAZA

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-17

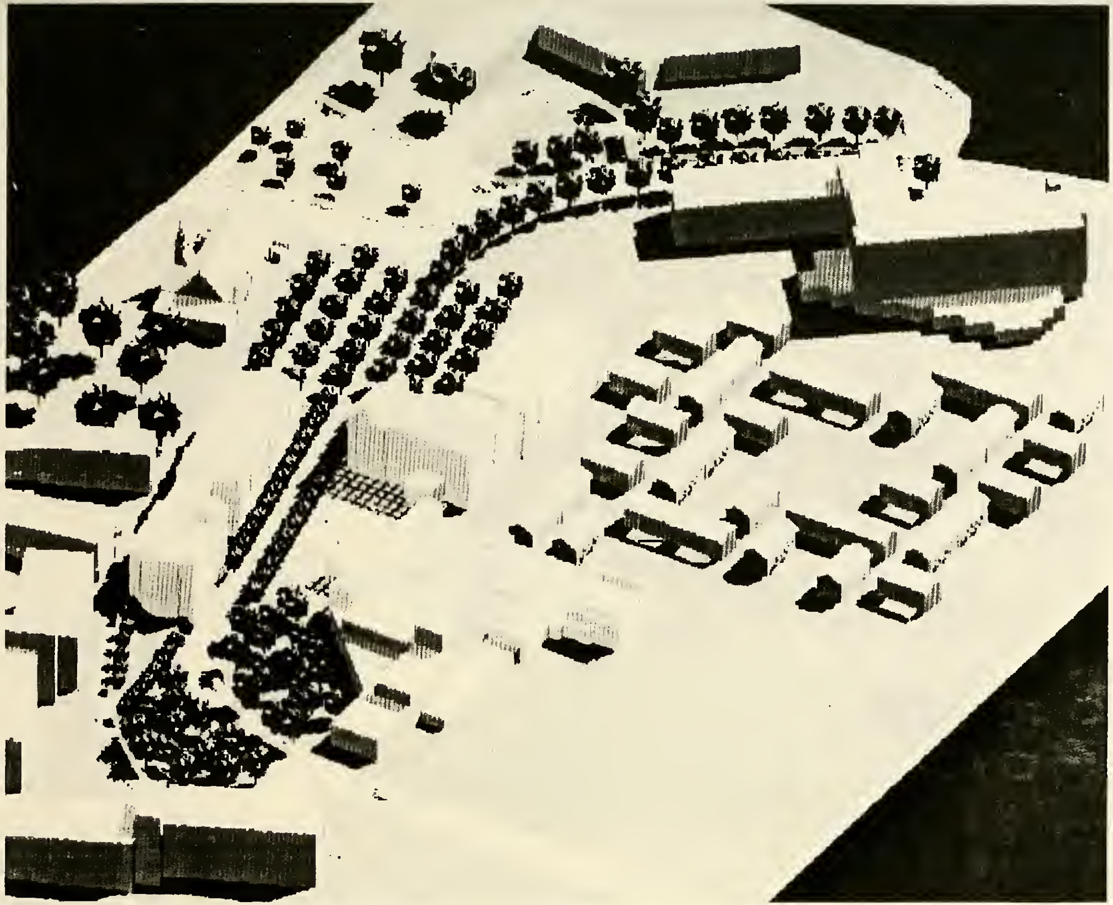


AERIAL VIEW FROM THE EAST

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4–18

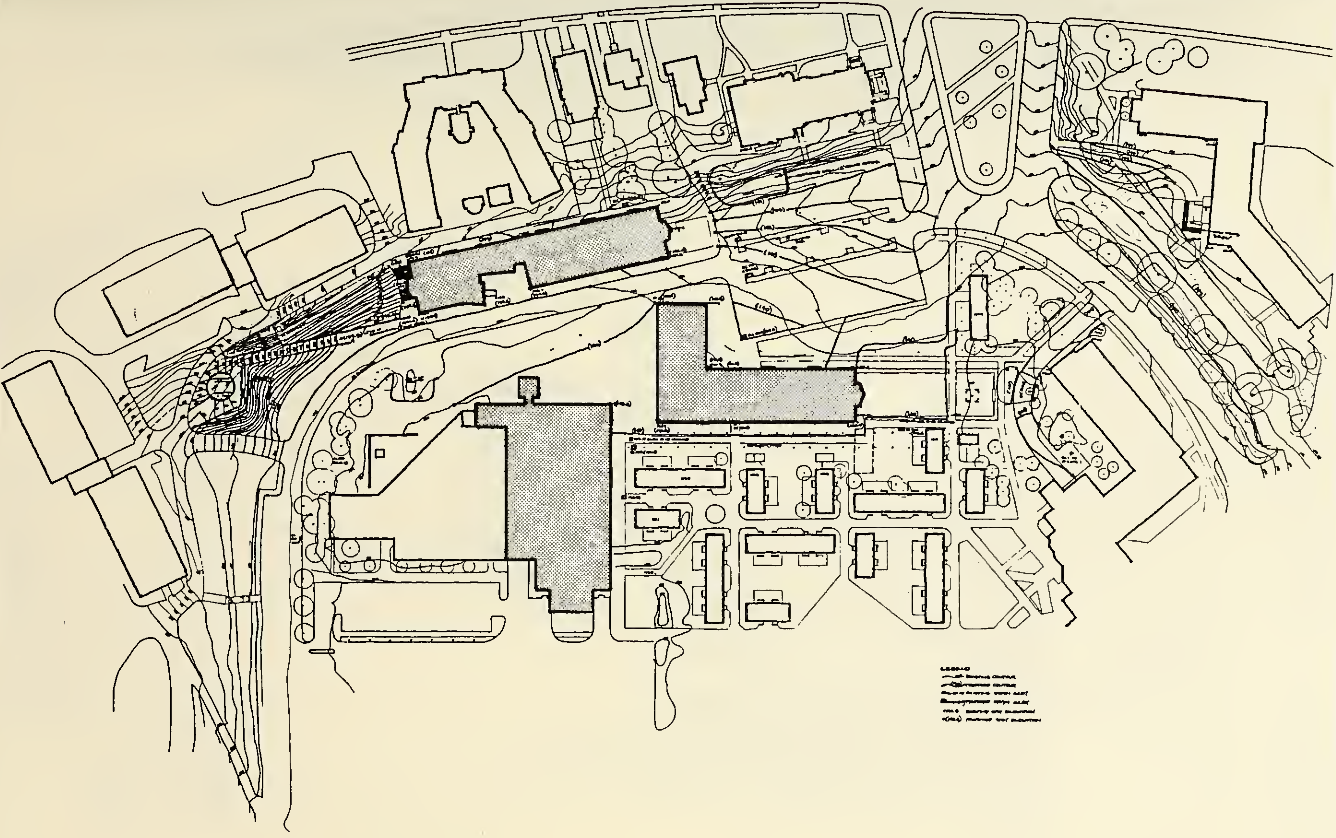


AERIAL VIEW FROM THE WEST

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

4-19



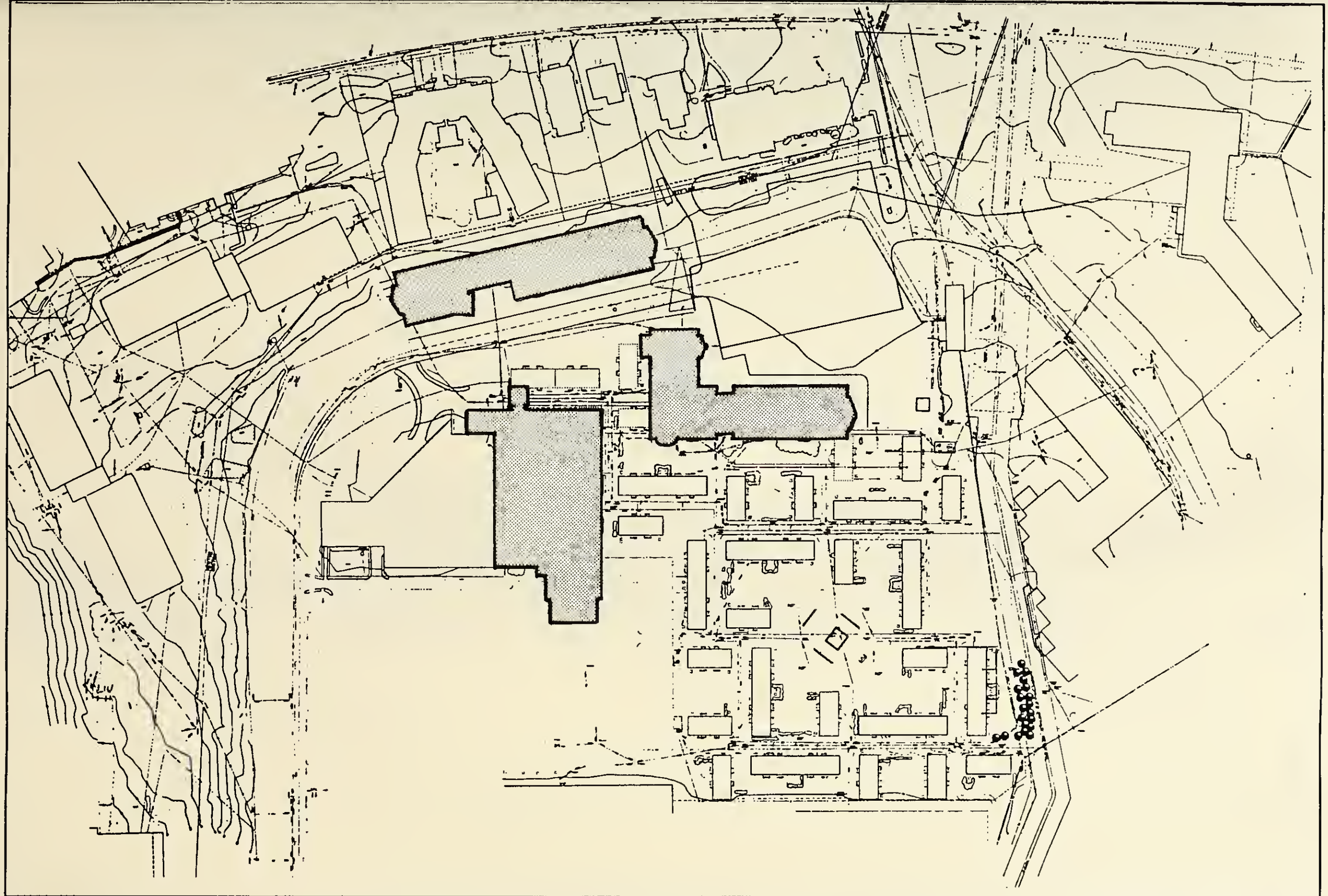
NORTH

PROJECT VICINITY SITE PLAN – GRADING PLAN

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

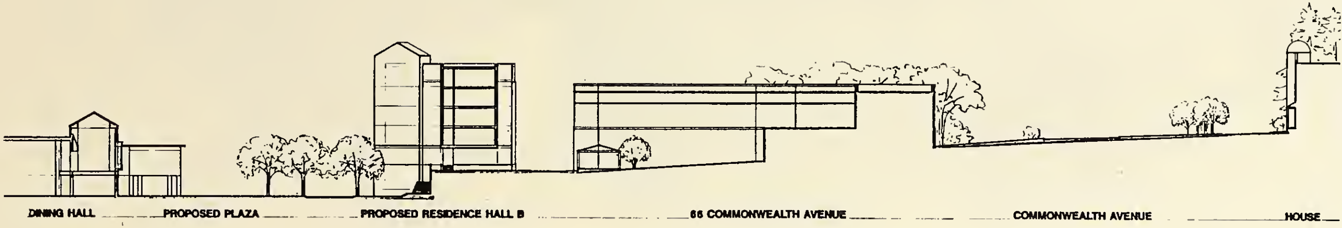
4–20



PROJECT VICINITY SITE PLAN – UTILITY PLAN

BOSTON COLLEGE: LOWER CAMPUS PROJECT

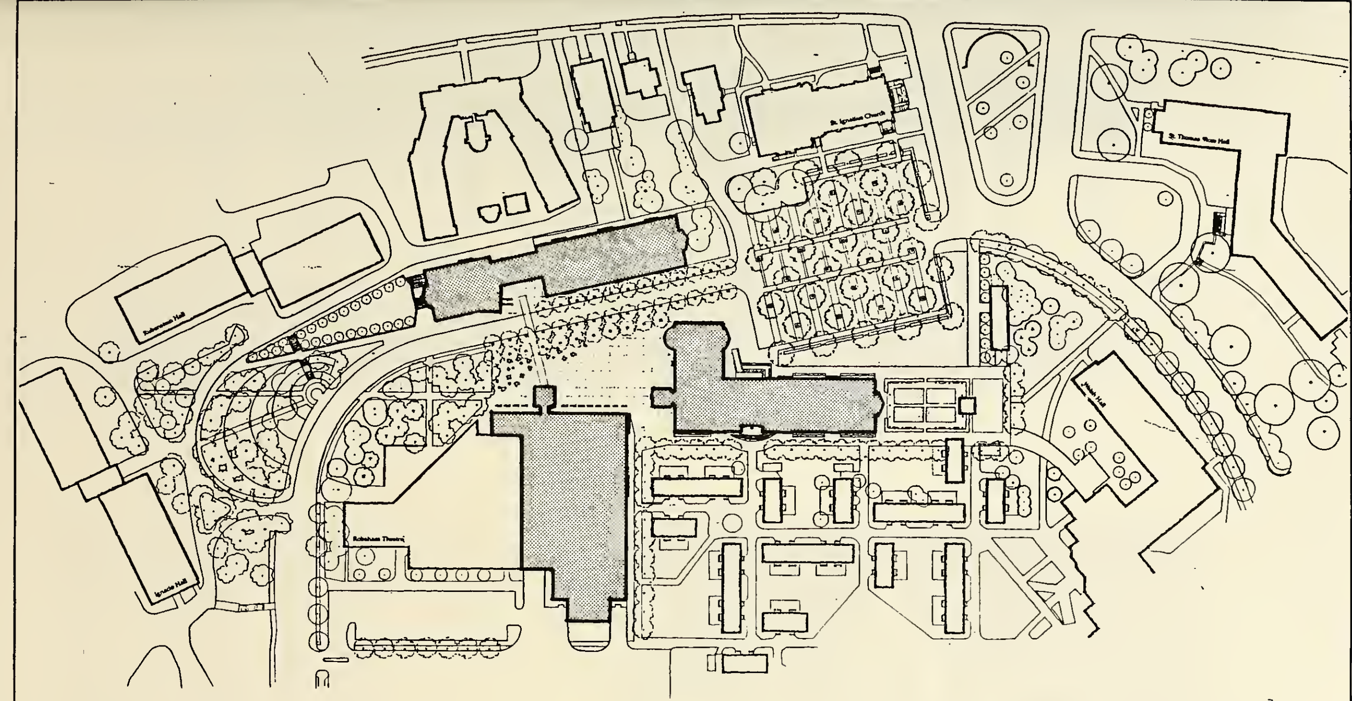
Figure 4-21



SITE SECTION

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure 4-22



BOSTON COLLEGE

LOWER CAMPUS RESIDENTIAL COMPLEX & DINING HALL

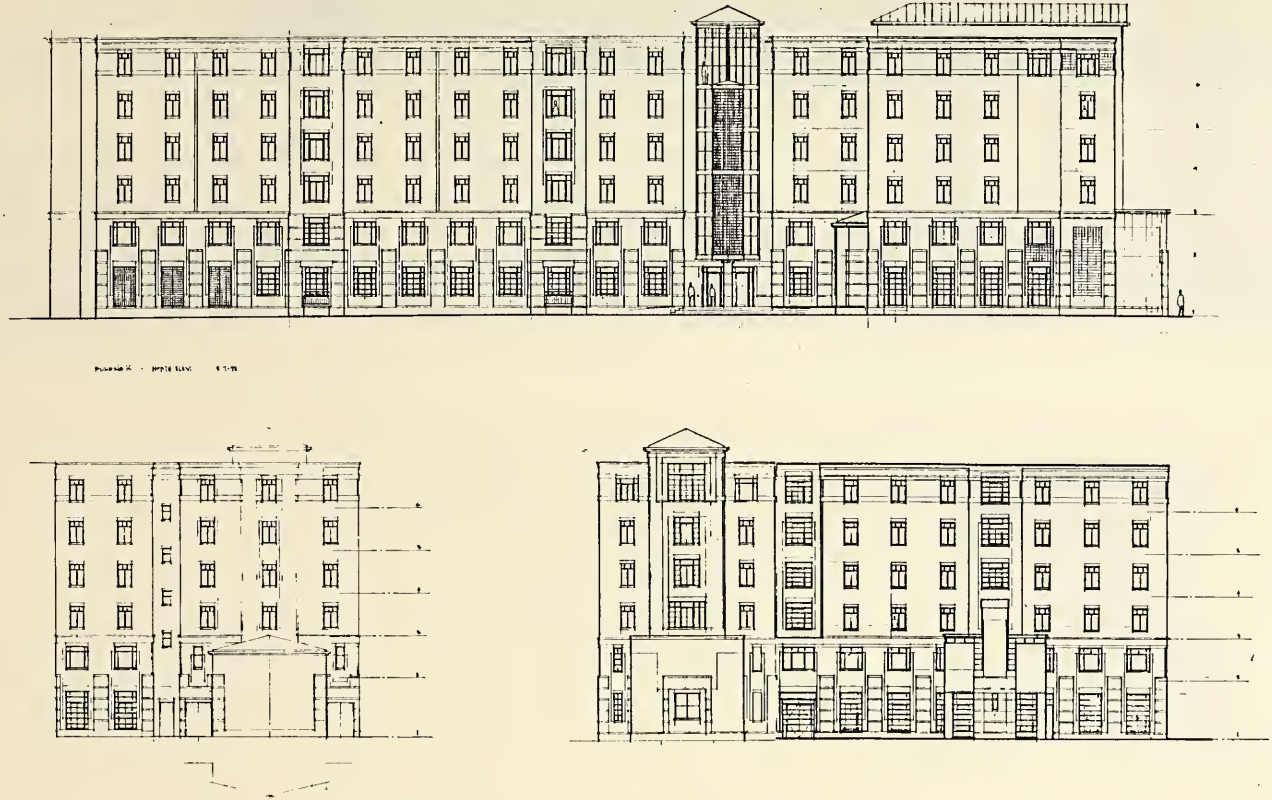
Prepared for: Perry Dean Rogers & Partners, Architects   Prepared by: Wallace Roberts & Todd, Landscape Architects   Scale: 1"=40'-0"

NORTH

PROJECT VICINITY SITE PLAN – PLANTING PLAN

BOSTON COLLEGE: LOWER CAMPUS PROJECT

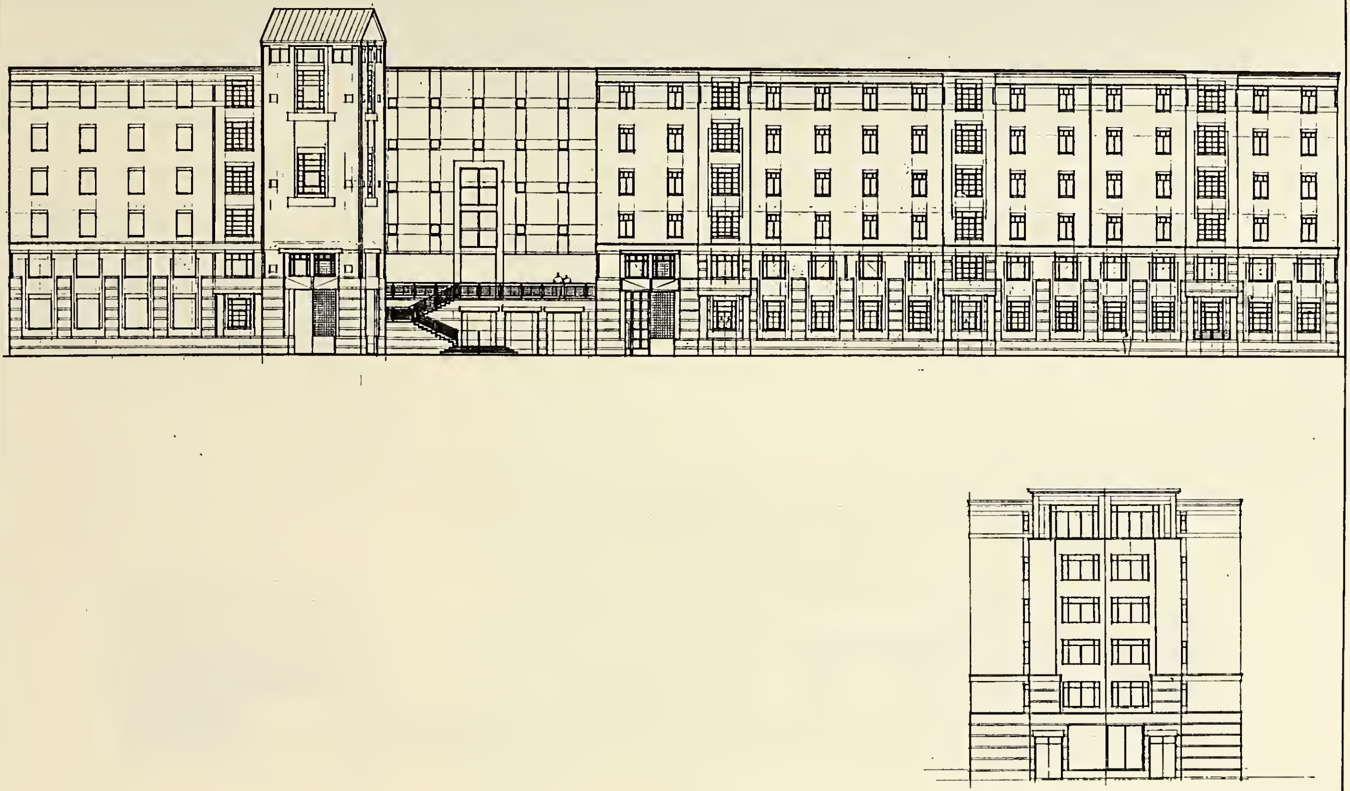
Figure 4-23



RESIDENCE HALL "A": ELEVATIONS

BOSTON COLLEGE: LOWER CAMPUS PROJECT

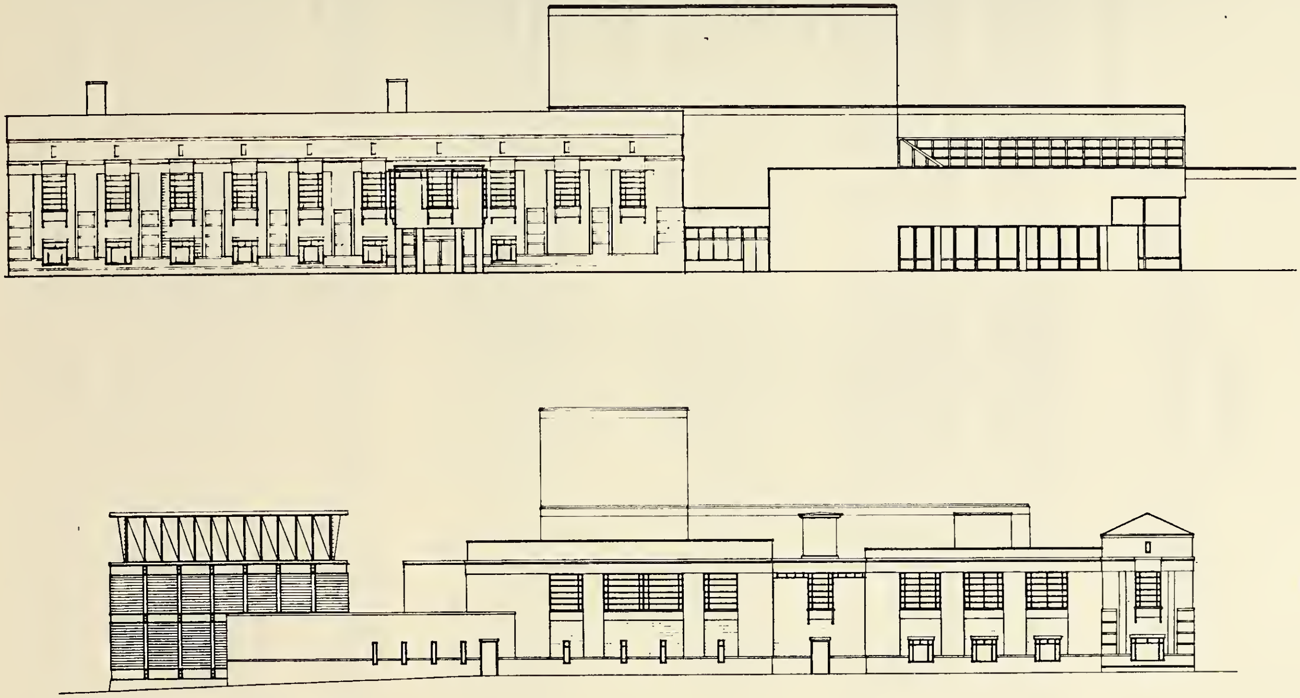
Figure 4-24



RESIDENCE HALL "B": ELEVATIONS

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure
4–25



DINING FACILITY: ELEVATIONS

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure 4-26

CHAPTER 5

HISTORIC RESOURCES COMPONENT

HISTORIC RESOURCES

Review of documentation at the Massachusetts Historic Commission indicate that no above-surface historically significant structures or sites within or in the immediate vicinity of the project boundaries will be adversely impacted by the proposed Project.

The underground aqueduct (1865 to 1870) from Cochituate, associated with the Chestnut Hill Road Reservoir, runs through the general area of the Project. The design of the new dining and dormitory facilities for Boston College have been designed to avoid disturbances to the historic aqueduct. The MWRA has been consulted and concurs with the proposed routing and construction techniques proposed for utility relocations and extensions.

The Chestnut Hill Reservoir Historic District, which includes several buildings associated with the functioning of the reservoir, is located approximately between 400 and 1,000 meters from the Project Site. The proposed Project will not have a negative effect on the setting of this National Register District.

ARCHAEOLOGICAL SITES

Prehistoric Archaeological Sites. Research through the files of Massachusetts Historic Commission and Timelines, Inc. indicated that there are no prehistoric sites within 500 meters of the project area. The two closest registered sites are 19-MD-179 and 19-MD-178 (located in Hammond Woods and the western end of Strongs Pond, respectively); no period is identified and no artifacts are associated with either of the sites.

The buildings that make up the Project (Dormitories A and B and the Dining Facility) are located within and at the edge of a small depression (a probable glacial feature) that had been turned into a small reservoir and filled in 1940.

The 1819 Hales map shows a stream in the vicinity of the project with wetland zones on both margins. Small uplands are also shown in the general area to be developed, the remains of which are visible north and west of the Lower Campus Road. Although the presence of wetland and nearby higher dry areas could have lent the area archaeological potential, the disturbances resulting from past construction and the filling of the small reservoir have transformed the project area into a low to no potential area.

Historic Period Archaeological Sites. Review of the historic maps at the Massachusetts Historical Commission revealed the project area is unlikely to contain the remains of archaeological resources before the Early Industrial Period (1830 to 1870), when it was flooded to create a small reservoir. The reservoir was part of the Chestnut Hill Reservoir complex. The above-mentioned subterranean aqueduct is a potential historic resource within the project area.

IMPACTS

The core samples provided by McPhail Associates, confirm the location of the reservoir within the approximate contour of Lower Campus Road and reveal an upper layer of fill that ranges from approximately 5 feet by the northern slope to 34 feet at the southeast corner of the Dining Facility, possibly near the deepest area of the depression. The stratigraphy does not display any obvious sign of human occupation (no shells, charcoal, or cultural artifacts area are mentioned in the cores' description); this fact, combined with the construction plans, which recommend slabs-on-grade for Dormitory B and the Dining Facility, and above-grade slabs for Dormitory A, suggests that the impacts of the projects to cultural resources (if any are still present) are minimal.

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CHAPTER 6

INFRASTRUCTURE SYSTEMS COMPONENT

INTRODUCTION

In this section, the impact of the Project on water supply, the wastewater system, storm drainage, the natural gas system, and other utilities is evaluated. The analysis year for impact evaluation is September 1993 when the Project is complete. As part of this evaluation, the Boston Public Improvements Commission, the Boston Transportation Department, the city of Newton, the Boston Water and Sewer Commission, and the Massachusetts Water Resources Authority (MWRA) were contacted to determine proposed projects in the site vicinity that would affect utilities and should be included in background growth. Except for the proposed Chestnut Hill Rehabilitation by the MWRA, no projects in the site vicinity were identified. The Chestnut Hill Rehabilitation Project is a renovation of existing MWRA buildings (approximately 48,000 square feet) and will not affect utility demand or impacts of the Boston College Lower Campus Housing and Dining Facilities Project.

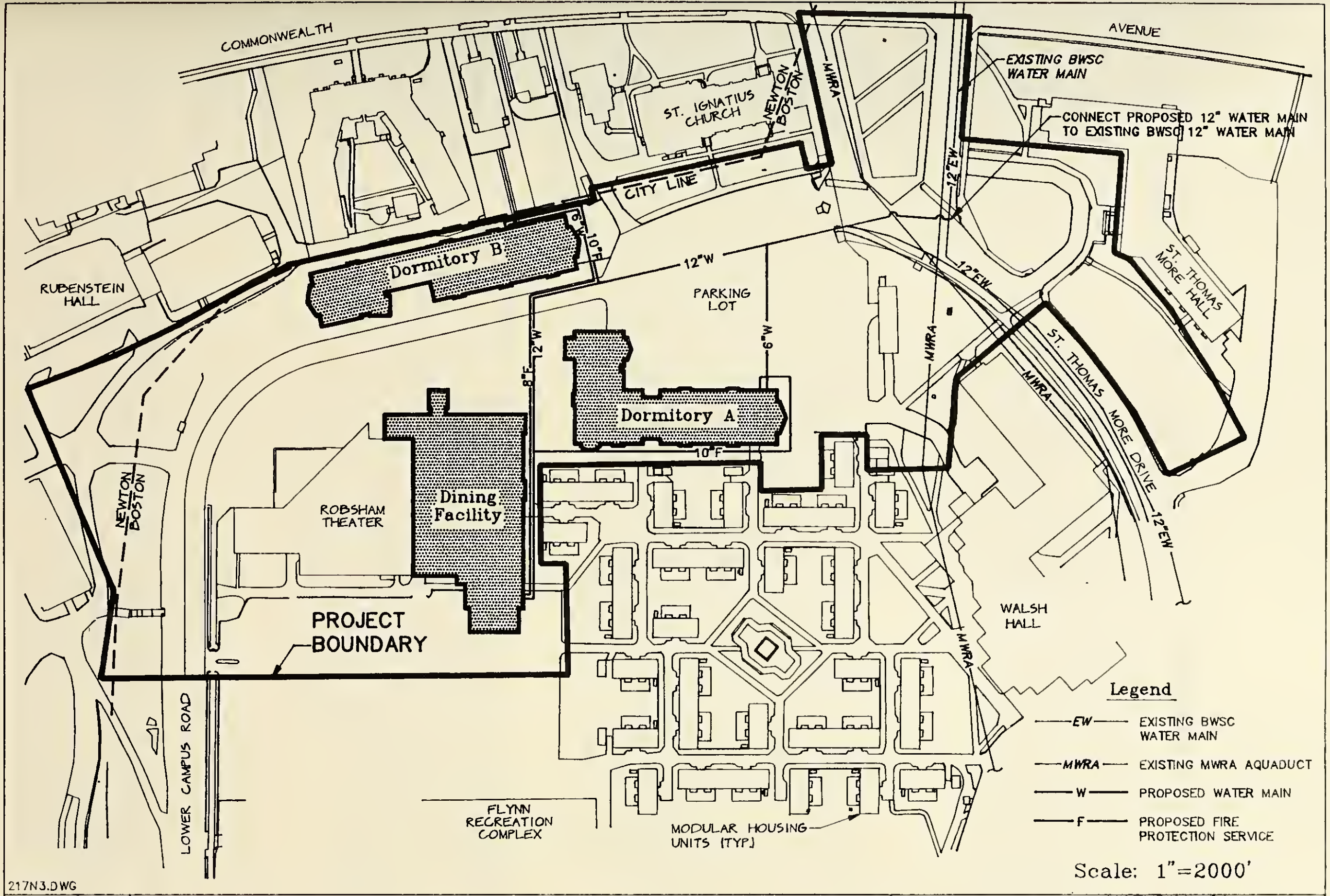
As part of Boston College's Master Plan, two additional Boston College projects will be constructed by 1996: the student center and parking garage. Construction for these projects will not start until after September 1993 and will not affect the utility requirements of the Lower Campus Housing and Dining Facilities Project. A utility evaluation for the garage and student center will be performed when the Project Notification Form on those projects is prepared.

WATER SUPPLY

Existing Conditions

Water is supplied to the cities of Boston and Newton through a distribution system operated and maintained by the MWRA. The MWRA services a total of 46 communities in eastern Massachusetts. The MWRA draws its water supply principally from the Quabbin and Wachusetts Reservoirs. In the city of Newton, the water distribution system is entirely operated and maintained by the MWRA, whereas in the city of Boston, the water distribution system is operated and maintained by the Boston Water and Sewer Commission (BWSC). Boston and Newton each provide water service to a portion of the Boston College Campus.

The water supply for domestic use and fire protection in each of the buildings on the proposed project site will be provided by extending a new 12-inch service main from the existing 12-inch BWSC water main located in St. Thomas More Drive (Figure 6-1). The existing 12-inch water main originates at a 16-inch BWSC water main located in the



PROPOSED WATER UTILITY CONSTUCTION

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure 6-1

intersection of Lake Street and Commonwealth Avenue and presently supplies water to Walsh Hall and Edmonds Hall on Lower Campus.

A flow test was conducted in the vicinity of the proposed project site in order to determine the existing operating conditions of the 12-inch water main. Before the flow test, the static pressure recorded at the gage hydrant was 45 pounds per square inch (psi). The residual pressure measured during the flow test was 42 psi. The flow rate available in the 12-inch water main was calculated to be approximately 1035 gallons per minute (gpm).

Project Impact

The estimated water demand for the proposed project is approximately 62,000 gallons per day (gpd). This estimate includes each of the three proposed facilities and also accounts for the reduction in existing demand due to the demolition of the existing modular housing buildings. The water demand for the project is estimated to be 105 percent of the sanitary sewage flow (this assumes that 5 percent of the total water use is consumed and is not discharged as wastewater), which is discussed in the next section, and a 1,000 gpd allowance for water required in mechanical systems such as air conditioning. Water conservation measures will be employed in each of the buildings and will include the use of low flow toilets, aerator-type faucets and shower heads, and energy efficient water heaters. According to the BWSC, the current water supply available at the project site is adequate to meet the proposed domestic and fire protection demands.

Construction of the proposed water distribution system for the Project will require the crossing of two MWRA aqueducts. The aqueducts are located west of the existing 12-inch water main in St. Thomas More Drive and are 48 inches and 60 inches in diameter. Boston College will work closely with the MWRA to ensure that the aqueducts are accurately located and properly protected during construction. The operation of the aqueducts will not be interrupted during construction. Disruption of existing water service will be minimized by making the connection of the proposed water main to the existing BWSC system with a tapping sleeve and valve.

WASTEWATER

Existing Conditions

Wastewater from the existing lower Boston College Campus, including the project site, is discharged to the city of Boston's municipal sewer system. Boston's wastewater collection system is operated and maintained by the BWSC. Under existing conditions, wastewater from the existing facilities is collected and discharged to the BWSC system via two sewage pumping stations. Force mains from the pumping stations convey the wastewater to a sewer manhole located in the intersection of Lake Street and

Commonwealth Avenue, where it is discharged to a 12-inch gravity sewer. Boston's wastewater collection system consists of an extensive network of gravity sewers, interceptors, pumping stations, and force mains. The city's wastewater is collected and ultimately discharged to the MWRA wastewater treatment plant located on Deer Island in Winthrop, Massachusetts.

Project Impact

The wastewater discharge from the proposed facilities is estimated to be approximately 58,000 gpd. The proposed wastewater flow was calculated in accordance with the Massachusetts State Environmental Code, Title 5 and is presented in Table 6-1 below.

TABLE 6-1

SANITARY SEWAGE FLOW ESTIMATE

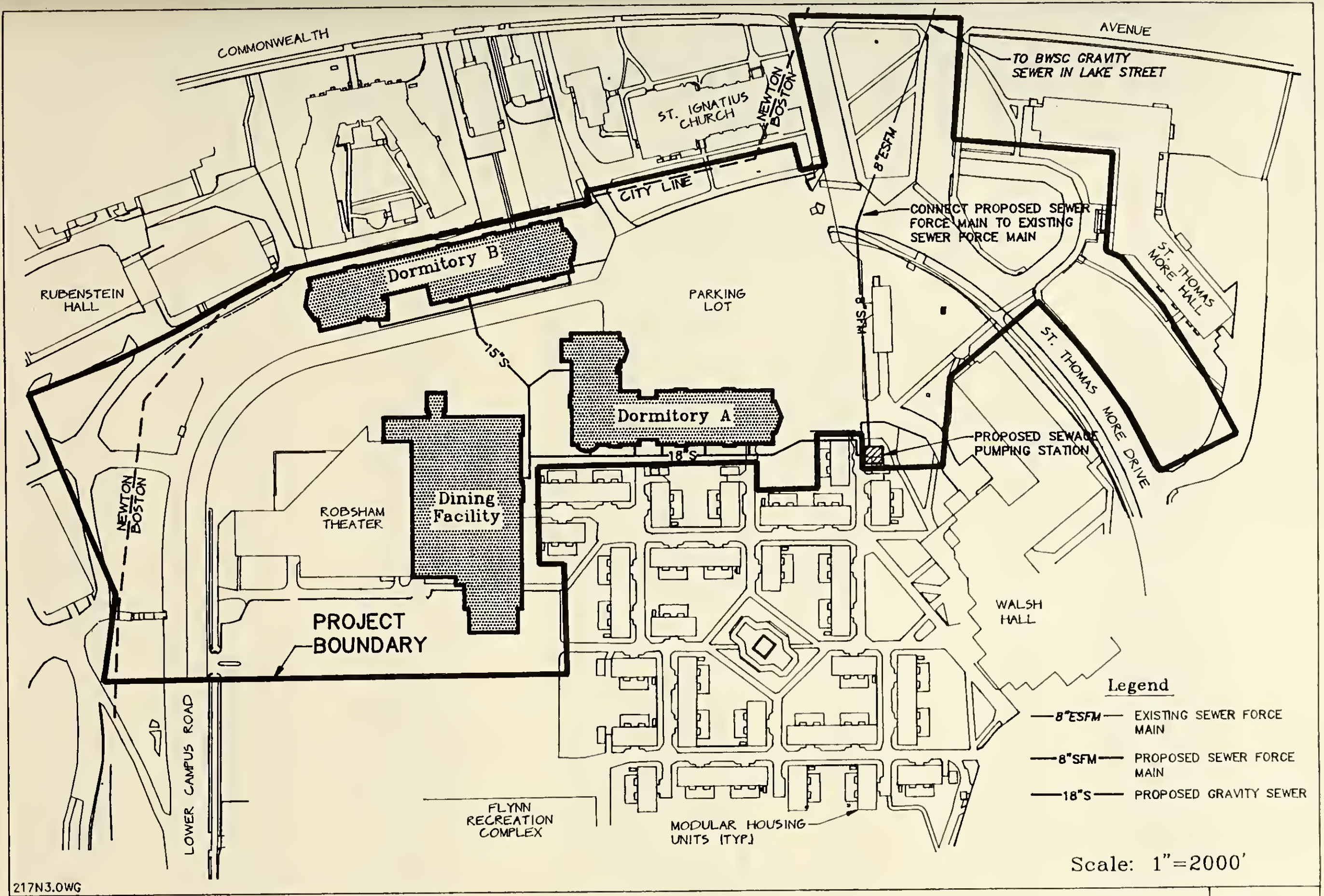
Dormitory A	Dining Facility
380 student beds × 30 gppd[1] = 11,400 gpd[2]	800 student seats × 35 gpsd[3] = 28,000 gpd
11 resident advisor beds × 30 gppd = 330 gpd	305 function seats × 35 gpsd = 10,675 gpd
Subtotal for Dormitory A = 11,730 gpd	Subtotal for Dining Facility = 38,675 gpd
Dormitory B	Removal of existing Dormitory units
	120 student beds × 30 gppd = 3,600 gpd
354 student beds × 30 gppd = 10,620 gpd	
11 resident advisor beds × 30 gppd = 330 gpd	
Subtotal for Dormitory B = 10,950 gpd	
Total Sanitary Sewage Flow: 61,355 gpd - 3,600 gpd = 57,755 gpd	

[1] gppd = gallons per person per day

[2] gpd = gallons per day

[3] gpsd = gallons per seat per day

According to the BWSC, the capacity in the existing sewer system is sufficient to accommodate the wastewater discharge from the proposed facilities. Gravity sewers will be constructed on the project site to convey wastewater discharge from the proposed buildings to a newly constructed sewage pumping station (Figure 6-2). The new pumping station will replace the two existing stations currently being used. To prevent the disruption of sewer service during construction, the two existing stations will remain operational. Once the new pumping station is complete the existing stations will be abandoned.



NORTH

PROPOSED SEWER UTILITY CONSTUCTION

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

6-2

A new 8-inch sewer force main will be constructed from the new pumping station to a point where it will be connected to an existing 8-inch force main that discharges to the sewer manhole discussed above. The new sewage pumping station and force main will be in accordance with the Guides for the Design of Wastewater Treatment Works and the BWSC.

Boston College will work closely with the BWSC to minimize impacts on the wastewater system during construction.

STORM DRAINAGE

Existing Conditions

The project site is located within the watershed of the Chestnut Hill Reservoir. The Chestnut Hill Reservoir is a distribution reservoir in the MWRA system and is used for water supply purposes only during periods of high demand.

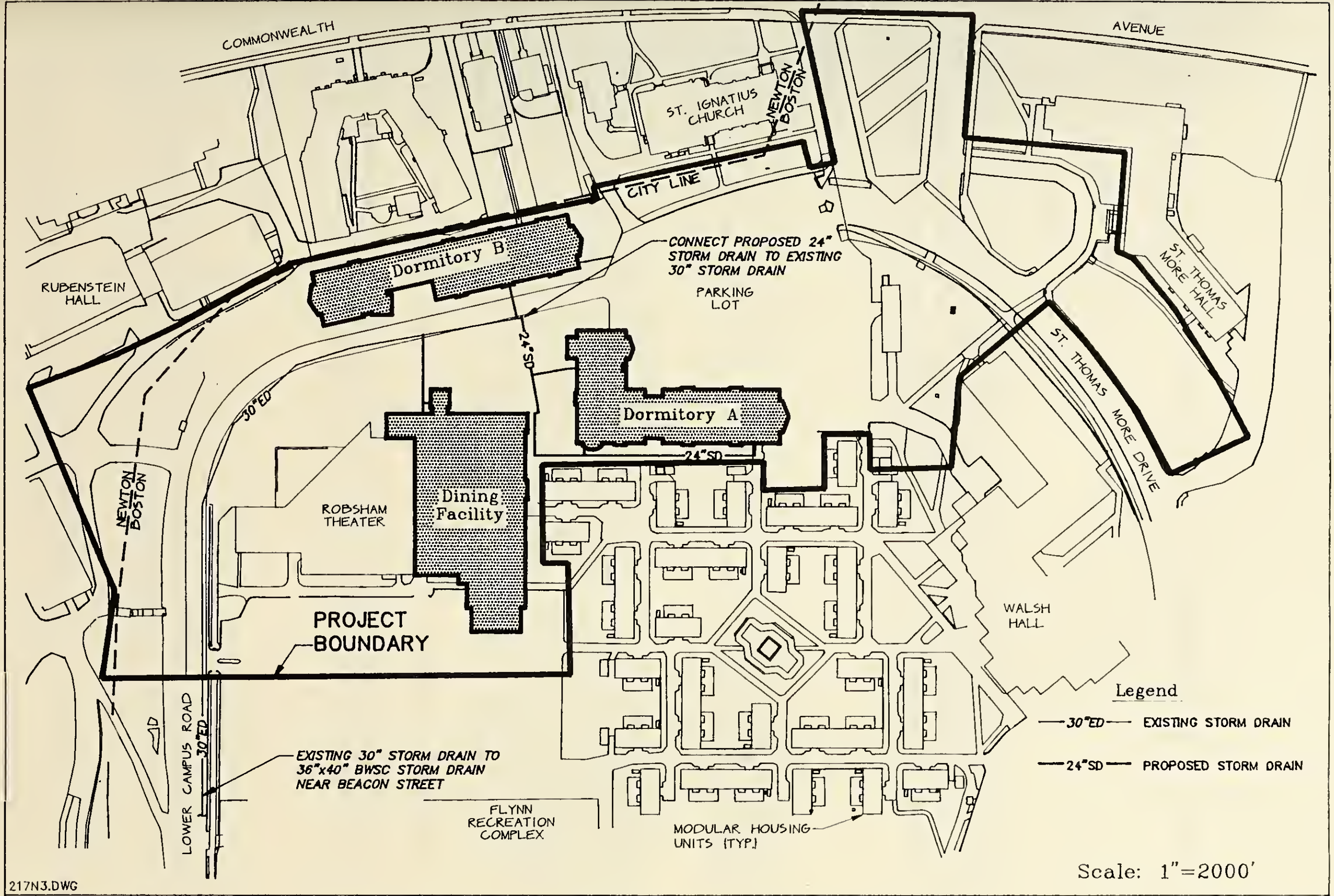
Currently, stormwater runoff from the project site is collected in on-site catchbasins and storm drains and discharged via a 30-inch storm drain, located in Lower Campus Road, to the city of Boston's storm drainage collection system. The connection point of the 30-inch storm drain to the Boston system is located south of Alumni Stadium, adjacent to Beacon Street. The size of the municipal storm drain at this point is 36 inches by 40 inches. Stormwater runoff from the site is conveyed through the city of Boston's system and ultimately discharged to the Chestnut Hill Reservoir. Boston's storm drainage system is also operated and maintained by the BWSC.

Project Impact

The proposed Project will alter the surface characteristics of the existing site by creating increased impervious area that will result in an increase in stormwater runoff. A stormwater analysis that studies the effects of the project development on runoff volumes and discharge rates from the site will be completed once the project landscape design is finalized.

The water quality of the stormwater runoff from the proposed project site is expected to be consistent with that from the existing site; therefore, no increased adverse affects on the Chestnut Hill Reservoir are expected. Drainage system improvements, including a new 24-inch storm drain that will convey stormwater from the proposed site to the existing 30-inch storm drain in Lower Campus Road, will be constructed as part of the Project (Figure 6-3).

During construction, measures will be taken to control soil erosion and siltation throughout the project site. Silt fences and hay bale check dams will be used to prevent silt from being washed off-site or into the existing storm drainage system. Exposed



PROPOSED STORM DRAIN UTILITY CONSTRUCTION

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure 6-3

embankments and areas of disturbed soil will be maintained and measures will be taken to prevent soil erosion.

NATURAL GAS SYSTEM

Existing Conditions

The Boston Gas Company operates and maintains a regional natural gas distribution network and presently provides service to the Boston College Campus. An existing 8-inch intermediate pressure service pipe located in St. Thomas More Drive is available for extension to serve the new facilities. The Boston Gas Company has indicated that the 8-inch service was installed in 1965 and is in good condition.

Project Impact

The natural gas load required for the new facilities has been estimated at approximately 32,000 cubic feet per hour (cfh). Boston Gas was consulted concerning the extension of natural gas service to supply the new facilities and has indicated that they can supply the anticipated gas load.

Construction of the new natural gas service pipes will be completed by the Boston Gas Company from the existing 8-inch service main up to and including the gas meters at the proposed buildings (Figure 6-4). The construction of the gas service, like that of the water service, will require the crossing of two MWRA aqueducts. The gas company will work closely with the MWRA to ensure the aqueducts are protected and remain in service during construction. Preliminary plans indicating the layout of the proposed gas line have been sent to both the MWRA and the Boston Gas Company.

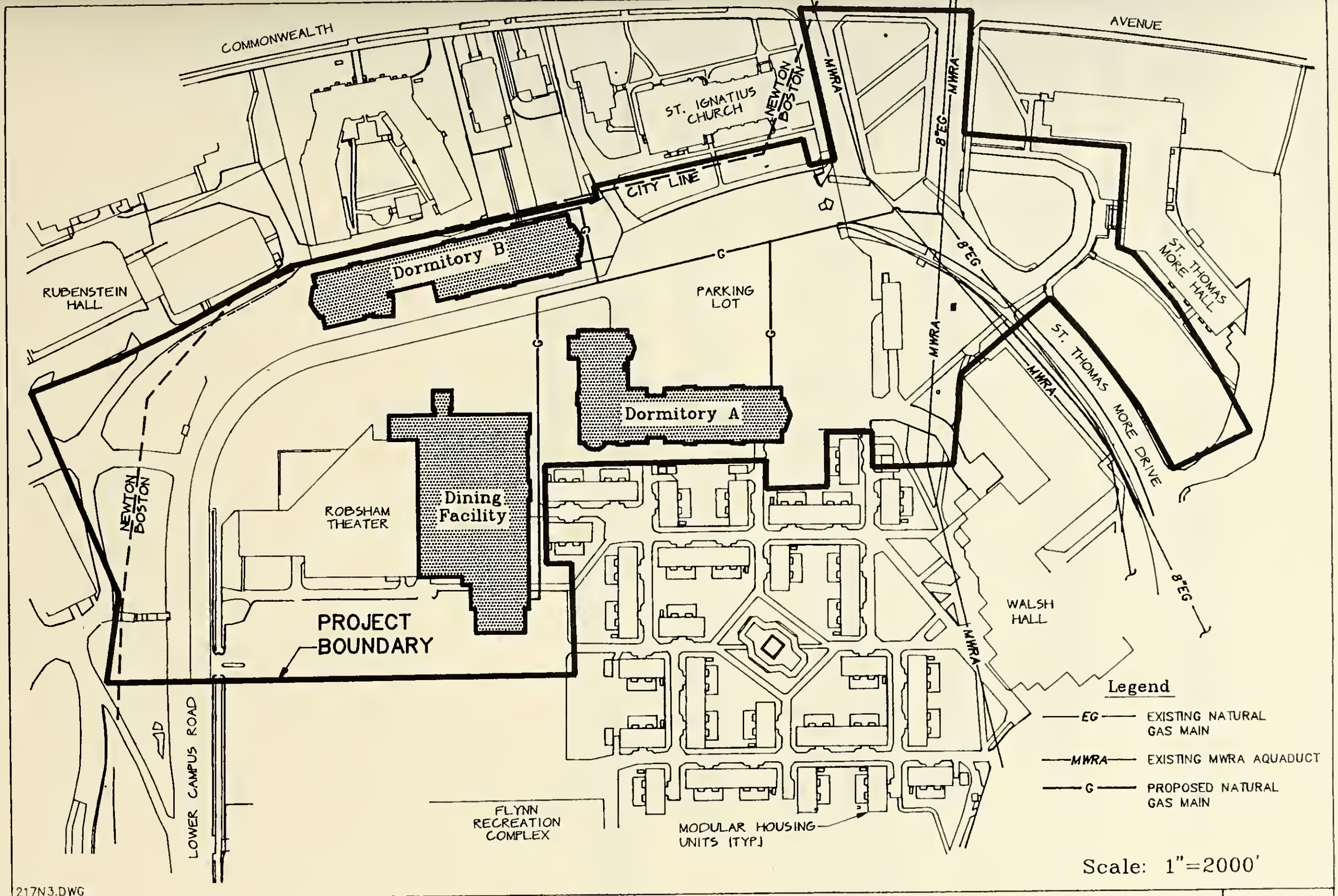
UTILITY SYSTEMS (POWER, TELEPHONE, FIRE ALARM, COMPUTER, CATV)

This section describes the existing Boston College Campus utility systems, the requirements of the new buildings, and the impact these additions will have on the existing systems.

Existing Conditions

The electrical system for the campus is presently serviced by Boston Edison Company via two dedicated 13.8 kilovolt (kv) circuits, each with 7.0 million volt-amperes (mva) capacity. Both of these circuits are backed up by a circuit shared with several additional customers, with a capacity of 5.5 mva available to Boston College.

The city of Boston municipal fire alarm circuit is available on campus for connection of fire alarm systems to the fire department supervisory system.



PROPOSED NATURAL GAS UTILITY CONSTRUCTION

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure 6-4

Telephone, computer, and cable television systems are presently distributed by Boston College privately.

Project Impact

The new buildings will be powered from the existing Boston College-owned 13.8 kv switchgear. An added connected load of 3,000 kva with an estimated demand of 1,200 kva is anticipated.

A new gas-fired steam boiler will provide process steam to the kitchen equipment and dishwasher booster heaters. The steam boiler will be 100 boiler horsepower.

Emergency power for each building's life safety systems will be provided by a diesel-fueled generator. Each of the three units will be 300 kva, installed indoors. Fuel supply will be provided in aboveground indoor tanks. The sound generated during operation will be 86 decibels at 3 feet. Each building will be protected by a manual and automatic fire alarm system.

Boston Edison has been contacted and informed of the anticipated additional load and has indicated that the required capacity is available via the existing circuits.

The existing municipal fire alarm circuit will be extended to each of the new buildings. New master boxes will be added to connect each building to the system. Telephone, computer, and cable television service will be distributed by Boston College via a new ductbank to be added during this construction.

221701.CH6.EKL.(KMN)

February 10, 1992

Mr. John T. Driscoll
Vice President for Administration
Boston College
140 Commonwealth Avenue
Boston, MA 02167

Re: Boston College Lower Campus Housing and Dining Facilities Project

Dear Mr. Driscoll:

Enclosed is the Scoping Determination for Boston College's Lower Campus Housing and Dining Facilities Project (the "Proposed Project"), for which you submitted a Project Notification Form ("PNF") pursuant to Article 31 of the Boston Zoning Code. This Scoping Determination requests information required by the Boston Redevelopment Authority in response to the PNF submitted November 14, 1991.

Additional information may be required during the course of review of the Proposed Project. If you have any questions regarding the Scoping Determination or the review process in connection with the Proposed Project, please contact me at 722-4300, extension 4286.

Sincerely,

Gerard Kavanaugh
Director of Institutional Planning

Enclosure

BOSTON REDEVELOPMENT AUTHORITY

SCOPING DETERMINATION

BOSTON COLLEGE LOWER CAMPUS HOUSING AND DINING FACILITIES PROJECT

SUBMISSION REQUIREMENTS FOR DRAFT PROJECT IMPACT REPORT

PROPOSED PROJECT:	Boston College Lower Campus Housing and Dining Facilities Project
PROJECT LOCATION:	Boston College, Lower Campus 140 Commonwealth Avenue Boston, MA 02167
APPLICANT:	Trustees of Boston College

The Boston Redevelopment Authority ("BRA") is issuing this Scoping Determination pursuant to Section 31-5 of the Boston Zoning Code (the "Code"). The applicant filed a Project Notification Form ("PNF") on November 14, 1991. The Scoping Determination requests information required by the BRA for its review of the Proposed Project in connection with the following:

(a) Development Review pursuant to Article 31 of the Code;

(b) Certification of consistency with Approved Institutional Master Plan, pursuant to Article 51 of the Code.

PREAMBLE

The BRA is reviewing the Proposed Project pursuant to multiple sections of the Code. The Proposed Project is being reviewed pursuant to Article 31, Development Review Requirements, which sets out a comprehensive procedure for project review and requires the BRA to review the design, transportation, environmental, and other impacts of proposed projects. Article 31 requires the submission of a satisfactory Final Project Impact Report ("FPIR") prior to the issuance of a building permit.

The Proposed Project is located within an Institutional Subdistrict and is therefore subject to review pursuant to Article 51 of the Code. The Proposed Project requires a certification of consistency with an approved Institutional Master Plan pursuant to Article 51. A project shall be granted a building permit only if such project is consistent with a current Institutional Master Plan approved by the BRA. Prior to the issuance of a building permit for the Proposed Project, the Director of the BRA must certify that the Proposed Project is consistent with the current approved Institutional Master Plan.

I. BOSTON COLLEGE LOWER CAMPUS HOUSING AND DINING FACILITIES PROJECT

Boston College is a not-for-profit, educational institution located partially in the Brighton neighborhood of Boston and partially in Newton. Boston College has an enrollment of 14,000 undergraduate, graduate and professional students. The College occupies approximately one million square feet of land and has a Boston campus FAR of approximately 2.0.

The Proposed Project consists of two undergraduate dormitory buildings and a dining facility, totalling approximately 267,500 gross square feet of new space. These buildings are identified in Boston College's ten (10) year Master Plan. A revised draft Boston College Master Plan was submitted to the BRA in the fall of 1991. The Master Plan is currently undergoing review by the BRA and the Allston-Brighton Boston College Community Relations Committee.

The Proposed Project is located within Boston College's Lower Campus, which is bounded by Commonwealth Avenue, Thomas More Drive, Beacon Street and the Boston-Newton line. The present land uses within the project site include a parking lot, existing modular housing, and open space. The Proposed Project site will occupy approximately 60,000 square feet of land.

The two proposed dormitory buildings will contain a total of approximately 225,000 square feet of gross floor area and will house approximately 614 net new beds. The height of the dormitory buildings will be be 6 stories above grade. The dining facility will be located in a separate building of approximately 42,500 gross square feet and will seat approximately 800 people. The dining facility will be 2 stories in height.

II. COMMUNITY REVIEW OF THE PROPOSED PROJECT

Boston College has been engaged in an extensive Master Plan community review process with the Allston-Brighton community through the Boston College Task Force. The Proposed Project constitutes an integral part of the Master Plan and will be reviewed coterminously with the Master Plan by the Task Force. The principal issues involved in the community review of the Proposed Project include: the number of dormitory buildings to be constructed; the locations of the dormitories; the total number of student beds to be added as a result of construction of the dormitories; and future plans for additional dormitory construction on the campus. It is anticipated that the community r of both the Master Plan and the Proposed Project will be completed by the end January 1992.

III. DEVELOPMENT REVIEW REQUIREMENTS - ARTICLE 31

SUBMISSION REQUIREMENTS

In addition to full-size scale drawings, 15 copies of a bound booklet containing all submission materials reduced to size 8-1/2" x 11", except where otherwise specified, are required. The booklet should be printed on both sides of the page. In addition, an adequate number of copies must be available for community review. A copy of this Scoping Determination should be included in the booklet for review.

A. GENERAL INFORMATION

1. Applicant Information
    - a. Development Team
        - (1) Names
            - (a) Developer (including description of development entity and type of corporation)
            - (b) Attorney
            - (c) Project consultants
        - (2) Business address and telephone number for each
        - (3) Designated contact for each
    - b. Legal Information
        - (1) Legal judgments or actions pending concerning the Proposed Project
        - (2) History of tax arrears on property owned in Boston by the Applicant
        - (3) Evidence of site control over the project area, including current ownership and purchase options of all parcels in the proposed project, all restrictive covenants and contractual

restrictions affecting the proponent's right or ability to accomplish the Proposed Project and the nature of the agreements for securing parcels not owned by the Applicant.

(3) Nature and extent of any and all public easements into, through, or surrounding the site.

2. Financial Information (See Appendix 1 for required financial information)

Development and Operating Pro Formas must be provided for the Proposed Project.

a. Full disclosure of financing references

b. Development Pro Forma

c. Ten (10) Year Operating Pro Forma

3. Project Area

a. Description of metes and bounds of project area or certified survey of project area

4. Public Benefits

The DPIR shall contain information on public benefits associated with the Proposed Project, such as:

a. Existing and estimated future Payment In Lieu Of Taxes (PILOT)

b. Anticipated employment levels including the following:

(1) Estimated number of construction jobs

(2) Estimated number of permanent jobs

c. Other public benefits, if any, to be provided.

5. Regulatory Controls and Permits

a. Existing zoning requirements, zoning computation forms, and any anticipated requests for zoning relief should be explained.

b. Anticipated permits required from other local, state, and federal entities with a proposed application schedule should be noted.

c. If the Executive Office of Environmental Affairs has deemed that the Proposed Project is subject to the Massachusetts Environmental Policy Act ("MEPA"), required documentation should be provided, including copies of the Environmental Notification Form ("ENF") and a proposed schedule for coordination with BRA procedure.

6. Community Groups

a. Names and addresses of project area owners, abutters, and also any community groups which, in the opinion of the applicant, may be substantially interested in or affected by the Proposed Project.

b. A list of meetings held and proposed with interested parties.

B. TRANSPORTATION COMPONENT

A Transportation Access Plan shall be prepared as defined by the Scope of Services outlined in Appendix 2.

C. ENVIRONMENTAL PROTECTION COMPONENT

1. Shadow

A shadow analysis is required for existing and build conditions for the hours 9:00 a.m., 12:00 noon, and 3:00 p.m. for the vernal equinox, summer solstice, autumnal equinox, and winter solstice. It should be noted that due to time differences (daylight savings vs. standard) the autumnal equinox shadows would not be the same as the vernal equinox shadows and therefore separate shadow studies are required for the vernal and autumnal equinoxes.

a) The shadow impact analysis must include net new shadow as well as existing shadow and must clearly show the incremental impact of the Proposed Project. Shadows produced by adjacent existing buildings also shall be included, as appropriate to indicate clearly the net shadow impact of the Proposed Project. A North arrow also shall be included.

b) Particular attention must be given to existing or proposed public open spaces and major pedestrian areas, including, but not limited to, the sidewalks adjacent to and in the vicinity of the project site and open space areas within or in the vicinity of the project site.

2. Solid and Hazardous Wastes

The presence of any contaminated soil or groundwater shall be identified, and measures that will be employed to ensure their safe removal and disposal shall be described. A copy of any Chapter 21E site investigations shall be included with the DPIR.

The generation of solid wastes during the construction period and operation of the Proposed Project and plans for removal and disposal shall be described. The management of solid waste should also include a recycling capability component.

3. Geotechnical Impact

An analysis of existing sub-soil and groundwater conditions, potential for ground movement and settlement during excavation, and potential impact on adjacent buildings and utility lines shall be required. This analysis shall also include a description of the foundation construction methodology, the amount and method of excavation, and measures to prevent any adverse effects on adjacent buildings and utility lines.

4. Construction Impacts

A construction impact analysis shall include a description and evaluation of the following:

(1) potential dust and pollutant emissions and mitigation measures to control these emissions and avoid adverse impacts on residents of the adjacent neighborhood

(2) potential noise impact and mitigation measures to minimize increase in noise levels and avoid adverse impacts on residents of the adjacent neighborhoods

(3) location of construction staging areas and construction worker parking

(4) construction schedule, including hours of construction activity

(5) access routes for construction trucks and anticipated volume of

construction truck traffic

(6) measures to protect the public safety, particularly of neighborhood residents and children

(7) potential impacts of dewatering of site and mitigation measures to minimize such impacts

5. Rodent Control

An analysis of the impact of project construction on rodent populations and a description of the proposed rodent control program, including frequency of application, and compliance with applicable City and State regulatory requirements shall be required.

D. URBAN DESIGN COMPONENT

The Proposed Project elements should be developed so as to (1) strengthen the overall urban design character of the Boston College Campus, and (2) enhance the relationship among existing buildings. The new construction should be compatible in footprint, massing, height, fenestration, details, and materials with existing campus buildings. The proposed new construction should also reinforce the existing pedestrian environment on and around the site and campus. In addition, the Proposed Project elements should be designed and constructed so as to minimize the visual impact of the building mass as seen from the view angles of the surrounding community.

To further these goals, the Proposed Project should be be planned and designed such that treatment of the massing, facade design, and details shall ensure comfortable scale relationships and compatibility of character between the proposed buildings, existing institutional buildings and the nearby community and residential areas.

In order to determine that the Proposed Project is (a) architecturally compatible with surrounding structures; (b) exhibits an architectural concept that enhances the urban design features of the area in which it is located; and (c) augments the quality of the pedestrian environment, the following items must be submitted for the Schematic Design Phase:

a) Written description of program elements and space allocation for each element.

b) Plan for the surrounding area and district and sections at an appropriate scale (1" = 50' or larger) showing relationships of the Proposed Project to the surrounding area and district:

  1. massing
  2. building height
  3. scaling elements
  4. open space
  5. pedestrian and vehicular circulation

c) Black and white 8"x10" photographs of the site and neighborhood

d) Sketches and diagrams of earlier proposals to clarify design issues and massing options

e) Eye-level perspective (reproducible line drawings) showing the proposal in the context of the surrounding area

f) Aerial views of the project

g) Site sections at 1" = 16' or 1" = 20" showing relationships to adjacent buildings and spaces

h) Site plan at an appropriate scale (1" = 40' or larger) showing:

  1. general relationships of proposed and existing adjacent buildings and open space
  2. open spaces defined by buildings on adjacent parcels and across streets
  3. general location of pedestrian ways, driveways, parking, service areas, streets, and major landscape features
  4. pedestrian, handicapped, vehicular and service access and flow through the parcel and to adjacent areas
  5. survey information, such as existing elevations, benchmarks, and utilities

    6. phasing possibilities

    7. construction limits

i) Facade design model at 1" = 8'.

j) Drawings at an appropriate scale (e.g., 1" = 8') describing architectural massing, facade design and proposed materials including:

    1. building and site improvement plans

    2. elevations in the context of the surrounding area

    3. sections showing organization of functions and spaces

    4. preliminary building plans showing ground floor and typical upper floor(s)

k) Proposed schedule for submittal of design development materials

Submission materials for Design Development and Contract Documents submissions can be found in Appendix 3.

E. HISTORIC RESOURCES COMPONENT

The DPIR must include an historic resource analysis which assesses the impacts of the Proposed Project's height, scale, massing, and other relevant environmental factors on any historic districts or buildings in the vicinity or on the site of the Proposed Project. In addition, the DPIR must include a reasonable assessment of the potential presence of any archaeological resources which may be disturbed by the construction of the Proposed Project.

F. INFRASTRUCTURE SYSTEMS COMPONENT

The Infrastructure Systems Component preliminary response submits anticipated volume requirements/generation for water, sewerage, electricity/energy, and gas. For the DPIR, a more detailed analysis is required as described in Section 31-10 of the Article 31:

> The applicant's submission shall include an evaluation of the Proposed Project's impact on the capacity and adequacy of existing water, sewerage, energy (including gas and steam), and electrical utility systems (including telephone, fire alarm, computer, cable, etc.), and the need reasonably attributable to the Proposed Project for additional systems facilities.

Any infrastructure system upgrading or connection requiring a significant public or utility investment, or creating a significant disruption in vehicular or pedestrian circulation, or affecting any public or neighborhood park or streetscape improvements, constitutes an impact which must be mitigated. The Proponent must research and demonstrate anticipated impacts in this regard, including specific mitigation measures, and must include all other proposed projects in the vicinity, including those which have submitted a PNF or detailed Master Plan, as background for analysis. Boston College's Ten (10) Year Master Plan buildout projections should be included in the background growth.

Thorough consultation with the planners and engineers of the utilities will be required, and should be referenced in the Infrastructure Systems Component report.

Particular consideration should be given to the upgrading or reconfiguration of existing sewage connections, including the potential upgrading of any combined sewer systems to separate storm drain and sanitary sewer systems. Measures taken to insure continuity of service to other utility users should be referenced.

From the PNF submitted regarding water consumption and sanitary sewage quantity, the proposed two buildings will apparently result in a very small increase in water demand and sanitary flow. The DPIR should include the following:

1. Estimated water demand and sewer flow quantity and the basis for each estimate. Include separate calculations for air conditioning replacement water and laboratory use.

2. A comparison of the former building's water consumption and sanitary flows with those of the two buildings in the Proposed Project.

3. Identify water conservation measures to be employed in the design of each building.

4. Detail methods of protection or proposed relocation of BWSC sewer lines and water mains.

The Project Proponent shall detail the energy source of the space heating, how it will be obtained, and plans for condensate reuse.

Appendix 1

REQUIRED FINANCIAL INFORMATION

REQUIRED FINANCIAL INFORMATION
BOSTON COLLEGE

DEVELOPMENT PRO FORMA includes all the information normally found in a development pro forma, by phase. This includes, but is not limited to:

- Land costs, per land square foot and total, by parcel, including any incremental disposition cost attributed to the project.
- Attribution of acquisition expense over project components (per FAR square foot, clinical, research, office, etc.)
- All hard costs on a per-unit and total basis by phase (disaggregated into base building, tenant improvement work, site work, furniture, fixtures and equipment, FF&E, etc.)
- All soft costs on a per-unit and total basis, (disaggregated into individual line items such as architectural, engineering, legal, accounting, and developer's fees, and any other professional fees, insurance, permits, etc.)
- All contingencies, on a per-unit and total basis, by phase (specify whether contingency is on hard costs, soft cost, or total cost).
- All assumptions regarding financing terms on acquisition, pre-development, construction and permanent loans, by phase (including financing fees, interest rates, drawdown assumptions, terms, participations, amortization).
- Calculation of housing and jobs linkage obligations, and anticipated payment method (over term of obligation or on a net present value basis).
- Any other project-related expenses not within any of the above categories.
- Calculation of Total Development Cost (TDC) by component, including total and per unit breakdown (e.g., per square foot clinical, research, office, etc.).
- Sources of debt and equity for total project costs.
- Projected financing sources, including bond issuing agencies such as HEFA or MIFA, banks, institutional investors, private, corporate or government donors (an analysis of the costs versus benefits of the financing options, including interest costs and loan terms, as well as a comparison between available sources, should be included).

10-YEAR OPERATING PRO FORMA includes all the information normally found in an operating pro forma, on a yearly basis. This includes, but is not limited to:

- Tabulation of gross and net (leasable) square feet for all clinical, research, office, or other use spaces.
- Schedule of all rents on a per square foot and total basis of space not operated directly by the institution.
- Anticipated operating expenses on per square foot and total basis, and clear explanation of division of expenses between owner and tenant (includes all commercial space).
- Tenant inducements, if any, including rent concessions (indicate magnitude of discount from market rates), free rent, tenant improvement allowances, etc. for commercial space.
- All other expense assumptions including property management fees.
- Anticipated leasing patterns (5 year, 10 year, etc.), lease-up rates, etc., for any commercial space.
- Calculation of debt service.
- Anticipated timing of future refinancing.
- For any research space, projections of grant income from government, corporate, philanthropic, or other entities.

Appendix 2

TRANSPORTATION ACCESS PLAN
SCOPE OF SERVICES

SCOPE OF SERVICES

TRANSPORTATION ACCESS PLAN
BOSTON COLLEGE LOWER CAMPUS
HOUSING AND DINING FACILITIES PROJECT
BOSTON, MASSACHUSETTS

SCOPE OF SERVICES

A. DESCRIPTION OF SERVICES

Boston College shall prepare a Transportation Access Plan for the proposed new construction project in accordance with the requirements of the Boston Redevelopment Authority (BRA) and the Boston Transportation Department (BTD). The Access Plan shall include the following:

- An evaluation of the project's short-term traffic impacts related to construction activity.
- An evaluation of project impacts on traffic, parking and public transportation.
- Consideration of loading and service vehicles.
- Identification of appropriate measures to mitigate project impacts.
- Monitoring of project impacts and travel characteristics.

The Access Plan shall incorporate, as necessary, information from previous transportation studies conducted in the area, as well as any data from transportation analyses conducted in connection with the Proposed Project.

B. STUDY AREA

The area of study is bounded by Commonwealth Avenue, Thomas More Drive, Beacon Street and the Boston/Newton line.

The following intersections will be studied:

1) St. Thomas More Drive/Beacon Street

2) Campus Drive/Beacon Street
3) Commonwealth Avenue/Lake Street

C. DEFINITION OF TASKS

Task 1 - Identification of Existing Transportation Conditions

Boston College shall compile data on supply and usage characteristics of the various transportation systems within the study area.

1.1 Traffic. The overall traffic conditions shall be defined. Available traffic volume counts will be supplemental with new counts, as necessary. Based on data gathered from all sources, a preliminary base traffic volume network will be developed to represent existing morning, evening and event-related conditions.

1.2 Parking. Parking characteristics near the site shall be defined. Information relating to current utilization of public and private spaces, hours of peak occupancy, turnover rates, types and purposes of users, rates, etc. at all facilities which will be affected by the Proposed Project, shall be included. The analysis of parking requirements associated with the project should compare these requirements to existing and projected available supply to identify surpluses or deficiencies.

1.3 Transit. Public transportation service and ridership information available from the MBTA or from previous reports shall be presented.

1.4 Pedestrians. Pedestrian conditions shall be described in detail. Counts shall be taken and presented so as to represent as accurately as possible the total volumes and locations of pedestrians along surrounding streets. Particular attention shall be paid to the vicinity of the MBTA Green Line Station.

Task 2 - Evaluation of Transportation Impacts

Expected long-term transportation impacts in the study area shall be estimated and evaluated.

2.1 Trip Generation. The development program shall be analyzed to estimate net new peak-hour and daily trips by mode. To estimate net new trips by mode, time of day, and direction, travel demand data shall be gathered from a selected group of faculty and research assistants who will be occupying the new facility. Such information shall include work patterns (start and end times), mode of arrival, auto occupancy, and residence location.

2.2 Trip Distribution. As with trip generation, trip distribution should be performed specifically for the project site. Estimations should be made of the probable origin of work and non-work trips to the site, on the basis of potential employee pool and the marketing characteristics of the retail space. Trip distribution is most appropriately described in terms of corridor of origin, e.g. Northwest, Southeast, etc.

2.3 Conditions to be Analyzed. The following time frames and conditions shall be analyzed:

- 1995 No-Build (assuming the project is not built), and
- 1995 Build (assuming No-Build traffic plus project trips, net of trips associated with any structures to be demolished).

2.4 Background Development. Building construction projects to be included in the No-Build and Build evaluations shall be defined and reviewed with BRA and BTD staff prior to the analysis.

2.5 Evaluation of Transportation Impacts Net new trips expected to be created by the proposed development shall be added to demands carreid by the existing roadway system plus new trips from background projects. Morning, evening and weekend peak hour and daily increases impacts shall be developed and analyzed for all travel modes.

1. Traffic Impacts - Volume-to-capacity ratio (V/C), available reserve capacity (ARC), and level-of-service (LOS) and delay calculations at, and queue lengths between, the study intersections.

2. Site Circulation - A detailed site paln shall be provided, showing proposed location of all vehicle and pedestrain access and pedestrian circulation.

3. Transit Impacts - The number of transit trips generated by the Proposed Project shall be compared with area transit route capacity.

4. Pedestrian Impacts - Pedestrian volumes generated by the project will be presented. Future volumes and pedestrian levels of service will be projected for the locations and crossings identified in section 1.4 shall be projected. Indicate impact of new pedestrian trips on

pedestrian levels of service and amenities.

Pedestrian paths and corridors across and through the project site shall be identified on a site plan.

5. Trucks and Service Vehicles - Truck and service vehicle traffic to the site shall be estimated. Access and egress for emergency vehicles shall also be evaluated.

2.6 Parking Impacts - The increased parking demand shall be compared with projected available supply to identify deficiencies. The analysis shall discuss long-term vs. short-term parking needs, as distinguished from construction period vs. post-construction parking impacts.

1. Parking demand generated by project by use, both long-term and short-term. On the basis of the traffic volumes projected in section 2.1 above, and using appropriate turnover rates, estimate project-generated parking demand in horizon year. Indicate user type (employee, visitor, retail patron, patient, etc.).

2. Displacement of existing on-site spaces will be noted, and replacement of same at new off-site locations. Conversely, degree to which proposed on-site facilities will replace existing off-site spaces lost will be identified.

3. Proposed management plan for parking facilities. Rates for both commercial and private spaces, as well as shared uses, will be given. Method of directing patrons to parking, lease arrangements with parking operators, parking pricing, and valet operations will be detailed.

4. A plan will be provided of all parking facilities, including layout, access, and size of spaces.

Task 3 - Impacts During Construction Period The transportation assessment shall include an estimate, insofar as is possible at present, of the impacts of the Proposed Project during the construction period, including the following:

1. Estimated number of daily construction worker trips by mode;

2. Frequency of truck movements and construction activities;

3. Provisions for construction worker parking and construction materials deliveries;

4. Temporary storage of construction equipment and materials; and

5. The need, if any, for street occupancy permits during construction.

6. A Construction Management Plan fully detailing these issues must be submitted to and approved by BTD prior to the issuance of a building permit.

Task 4 - Development of Mitigation Measures. Mitigation measures which would lessen the impacts of the Proposed Project on the transportation system shall be identified. Mitigation measures may include:

1. Measures to minimize trip and traffic generation;

2. Roadway/traffic operation improvements;

3. Transit improvements.

4. Improvements in pedestrian conditions

Specific commitments to be made by the Proponent shall be identified.

Task 5 - Report Preparation. The results of the above effort shall be incorporated into a "Transportation Access Plan" which shall describe the work performed during the study and document the study process, procedures, and findings for use by the BRA and BTD.

Appendix 3

SUBMISSION REQUIREMENTS FOR DESIGN DEVELOPMENT AND CONTRACT DOCUMENTS SUBMISSIONS

Phase II Submission: Design Development

1. Revised written description of the Proposed Project.

2. Revised site sections.

3. Revised site plan showing:

    a. Relationship of the proposed buildings and open space and existing adjacent buildings, open spaces, streets, and buildings and open spaces across streets.

    b. Proposed site improvements and amenities including paving, landscaping, lighting and street furniture.

    c. Building and site dimensions, including setbacks and other dimensions subject to zoning requirements.

    d. Any site improvements or areas proposed to be developed by some other party (including identification of responsible party).

    e. Proposed site grading, including typical existing and proposed grades at parcel lines.

4. Dimensional drawings at an appropriate scale (e.g., 1" = 8') developed from approved schematic design drawings which reflect the impact of proposed structural and mechanical systems on the appearance of exterior facades, interior public spaces, and roofscape including:

    a. Building plans

    b. Preliminary structural drawings

    c. Preliminary mechanical drawings

    d. Sections

    e. Elevations showing the Proposed Project in the context of the surrounding area as required by the BRA to illustrate relationships or character, scale and materials.

5. Large-scale (e.g., 3/4" = 1'-10") typical exterior wall sections, elevations and details sufficient to describe specific architectural components and methods of their assembly.

Outline specifications of all materials for site improvements, exterior facades, roofscape, and interior public spaces.

7. Eye-level perspective drawings showing the Proposed Project in the context of the surrounding area.

8. Samples of all proposed exterior materials.

9. Complete photo documentation (35 mm color slides) of above components including major changes from initial submission to the Proposed Project approval.

Phase III Submission: Contract Documents

1. Final written description of the Proposed Project.

2. A site plan showing all site development and landscape details for lighting, paving, planting, street furniture, utilities, grading, drainage, access, service, and parking.

3. Complete architectural and engineering drawings and specifications.

4. Full-size assemblies (at the project site) of exterior materials and details of construction.

5. Eye-level perspective drawings or presentation model that accurately represents the Proposed Project, and a rendered site plan showing all adjacent existing and proposed structures, streets and site improvements.

6. Site and building plan at 1" - 100′ for BRA's use in updating its 1" = 100" photogrammetric map sheets.

Phase IV Submission: Construction Inspection

1. All contract addenda, proposed change orders, and other modifications and revisions of approved contract documents which affect site improvements, exterior facades, roofscape, and interior public spaces shall be submitted to the BRA prior to taking effect.

2. Shop drawings of architectural components which differ from or were not fully described in contract documents.

TRANSPORTATION ACCESS PLAN

INTRODUCTION

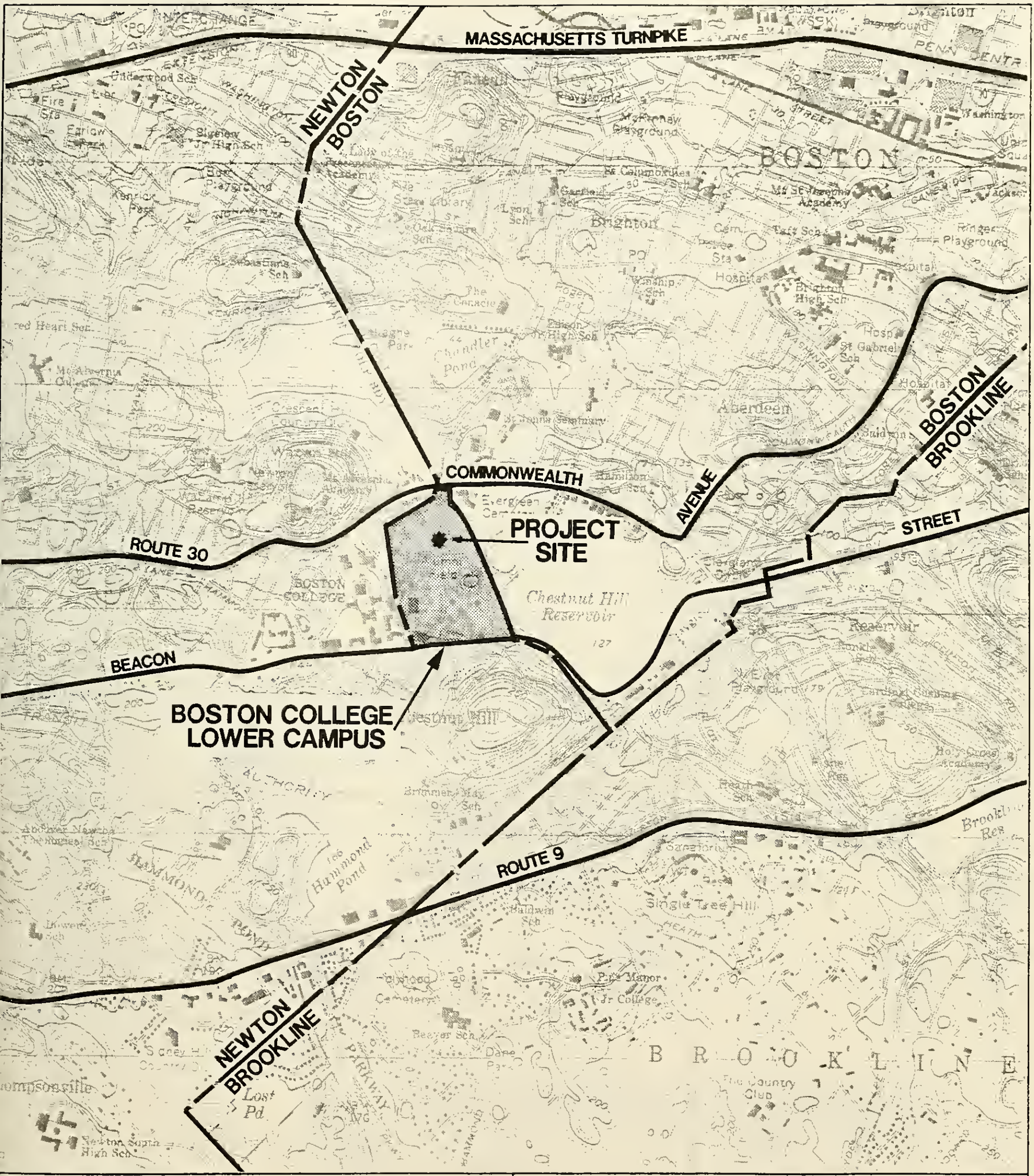
This Transportation Access Plan is prepared in accordance with the City of Boston Guidelines for Preparation of a Transportation Access Plan and with the Scoping Determination issued by the Boston Redevelopment Authority. It is an appendix to the Boston College Lower Campus Project Impact Report (Rizzo Associates, Inc., March 1992). Although a brief transportation analysis is presented in that report, this appendix provides a detailed description of the work undertaken to evaluate the transportation impacts of the proposed project on the study area roadway network.

The Lower Campus of Boston College is located in Brighton adjacent to the Boston/ Newton city line (see Figure 1). Boston College is constructing two new dormitories (Dormitory A and B) on this campus to increase its number of resident undergraduate students. A separate dining facility, also to be located on Lower Campus, will include a cafeteria, as well as a function room. As part of this project seven existing modular housing buildings (120 beds) will be demolished. The dining facility will replace an existing facility in Walsh Hall. A summary of the proposed Project and other specific information requested in the city of Boston guidelines is presented in Table 1. The proposed buildings are shown on Figure 2.

TABLE 1

PROJECT SUMMARY

Project Name and Address	Boston College Lower Campus Housing and Dining Facilities Boston College Lower Campus 140 Commonwealth Avenue Boston, MA 02167		
Project Sponsor	John T. Driscoll, Vice President for Administration Boston College 140 Commonwealth Avenue Boston, MA 02167 (617) 552-8878		
Construction Schedule	Begin May 4, 1992 Completion by August 31, 1993		
Current Zoning	Boston College Institutional Subdistrict Area		
Project Description	Dormitory A 115,000 gsf 380 student beds 11 resident advisor beds 6 stories	Dormitory B 110,000 gsf 354 student beds 11 resident advisor beds 6 stories	Dining Facility 51,000 gsf 800 student seats 305 function seats 2 stories



Boston College
Lower Campus Project

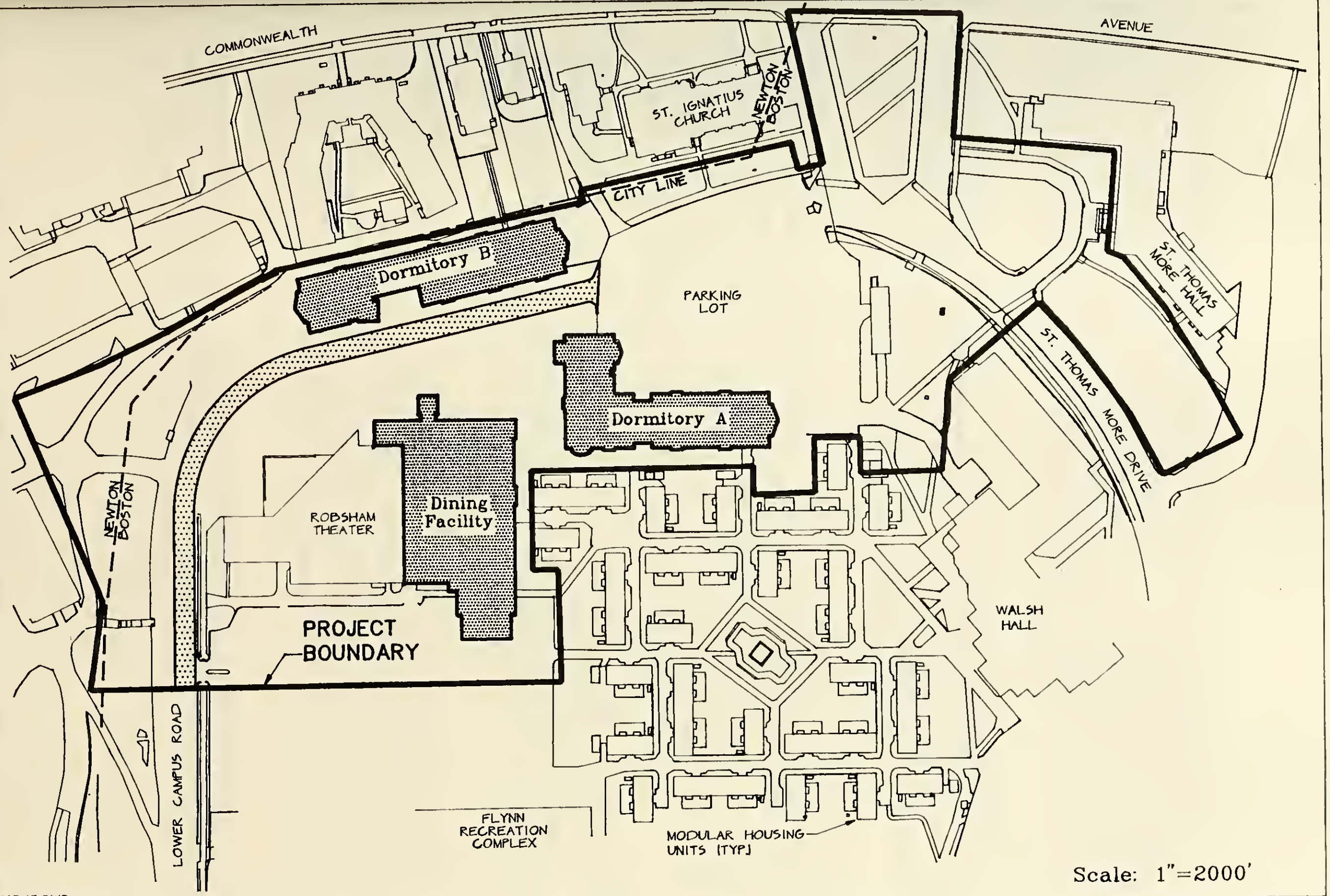
NORTH

0 2000
Scale in Feet

Base Map: USGS Topographic Map
Newton Quadrangle

Figure 1

Locus Map



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NORTH

PROPOSED PROJECT

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure
2

This document evaluates potential impacts to vehicular traffic flow at adjacent intersections, as well as parking impacts on the Lower Campus of Boston College. The methodology applied in the evaluation of transportation impacts and documented in this report comprises the following three major parts: existing conditions, future conditions (No-Build and Build), and mitigation measures. Each part represents an incremental overlay upon the previously completed work, resulting in a comprehensive study that addresses the development impact on future traffic conditions.

Existing Conditions. This component involves an evaluation of existing traffic flow and safety conditions of the study locations based on an engineering reconnaissance of roadway facilities, geometrics, daily and peak hour traffic volumes, and traffic control devices. The existing network serves as the base for development of future networks associated with off-site development traffic and project demand.

Future Conditions. As agreed upon with the Boston Transportation Department this report studies future traffic conditions in 1996. The methodology for quantifying the impacts of the proposed project consists of estimating future traffic volumes due to background growth (normal growth in through traffic) and new planned development projects in the study area. The studied intersections are then analyzed under the No-Build condition to determine their ability to carry the future traffic demand without traffic generated by the proposed Boston College Lower Campus project.

Under the Build condition, trips generated by the project are added to the base volumes developed under the No-Build condition. The study area intersections are analyzed to determine their ability to carry the additional traffic generated by the proposed development. The probable impacts of the project development are determined by comparing the No-Build conditions to the Build conditions.

Mitigation Measures. The final step in the study process is an evaluation of problem areas and identification of improvement actions to reduce or eliminate anticipated deficiencies. This includes locations whose deficiencies are unrelated to the proposed project development, as well as development-related deficiencies, if any. The recommended improvements considered may include both roadway/intersection geometric improvements and traffic control devices, as well as actions to reduce vehicle trip demand.

The methodology used to evaluate construction impacts included evaluation of traffic, pedestrian, and parking conditions prior to and during construction. Mitigation measures are recommended to reduce construction impacts to the campus.

EXISTING CONDITIONS

In developing a basis to assess the impact of the proposed dormitories and dining hall facility to be located on Lower Campus of Boston College, existing conditions on and surrounding the Lower Campus were inventoried. In this section, the roadway network within the study area is described in terms of its physical characteristics, traffic control devices, and traffic volumes. The existing public transportation network in the vicinity of the Lower Campus and the Boston College bus service is described in terms of existing routes and capacity. Finally, existing parking areas on Lower Campus and Boston College parking policies are discussed.

The Lower Campus of Boston College forms slightly less than half of the Chestnut Hill campus. It is bounded by Commonwealth Avenue to the north, St. Thomas More Road to the east, Beacon Street to the south, and Middle Campus (and the Boston/Newton city line) to the west. Vehicle access to Lower Campus is provided at four points: the St. Ignatius gate, two minor drives on St. Thomas More Drive, and the Beacon Street entrance to the parking garage. Vehicle access between Middle and Lower Campuses is not possible due to a major difference in ground elevation.

Lower Campus is used for residential and recreational functions, while Middle Campus is used for academic and administrative purposes. Upper Campus is all residential.

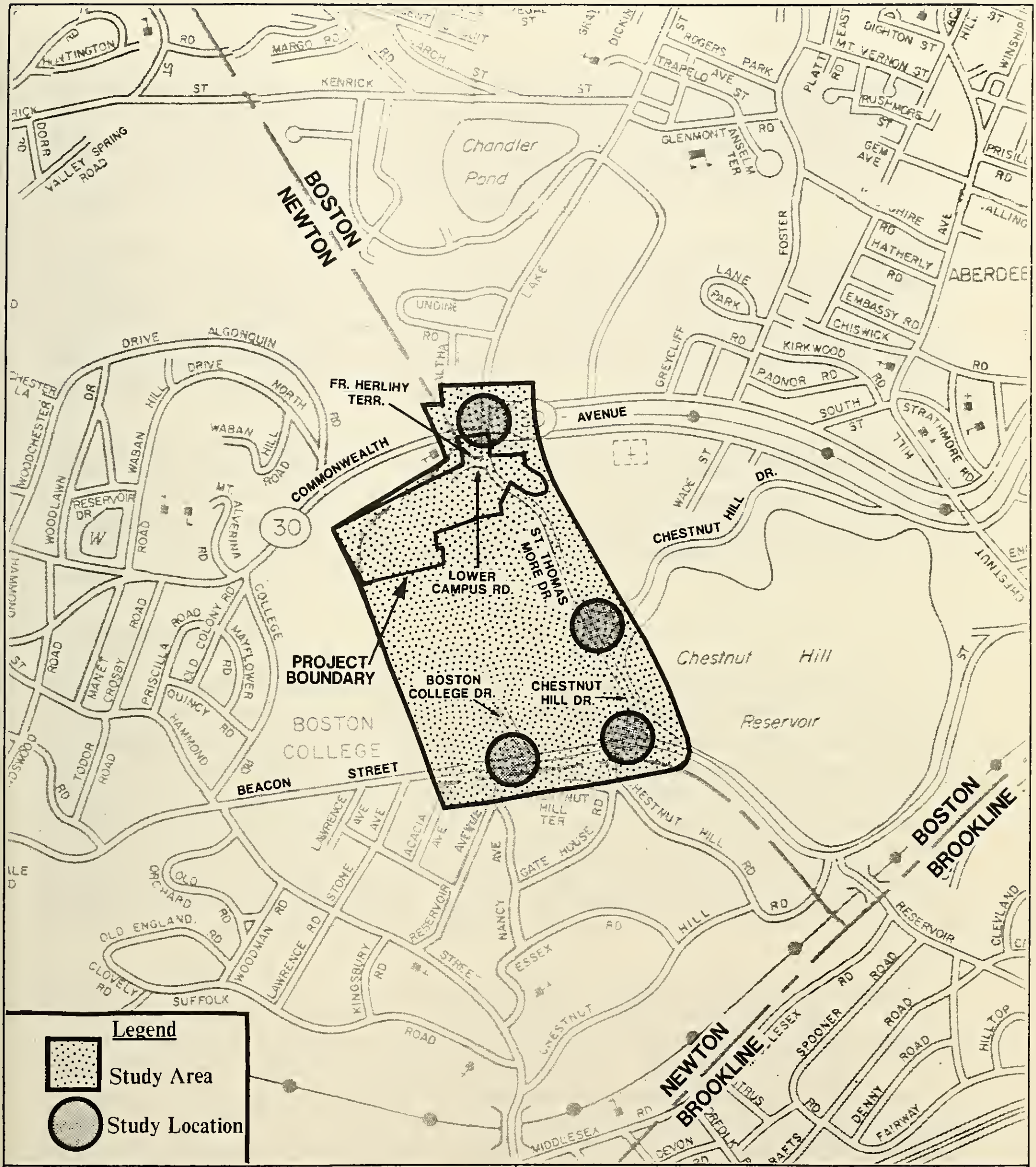
STUDY AREA ROADWAY NETWORK

The study area, as defined in the Boston Redevelopment Authority's Scoping Determination, is bounded by Commonwealth Avenue on the north, St. Thomas More Road on the east, Beacon Street on the south, and the Boston/Newton city line on the west. The following intersections located within the study area are fully evaluated for project-related impacts:

- Commonwealth Avenue/Lake Street/St. Thomas More Road/Father Herlihy Terrace
- Beacon Street/Chestnut Hill Drive/Chestnut Hill Road
- St. Thomas More Drive/Chestnut Hill Drive
- Beacon Street/Reservoir Avenue/Boston College driveway

Figure 3 depicts the study area and study locations.

In this section, the roadway network within the study area is described in terms of its physical characteristics, geometrics, and traffic control devices. Daily and peak hour traffic volumes are presented along with the existing operating conditions of the study area intersections.



Boston College
Lower Campus Project

NORTH

0 1,000
Scale in Feet

Base Map: MDPW Urban Area Series Map

Figure 3

Study Area

The major street network in the vicinity of Boston College is predominated by regional facilities extending in an approximate east-west direction between downtown Boston, Brighton/Brookline, and Newton. These roadways include Washington Street and Commonwealth Avenue on the north side of Boston College and Beacon Street and Boylston Street to the south of Boston College.

The major roadways are supported and interconnected by a series of streets generally serving a relatively more minor role and located in an approximate north-south direction. These include Chestnut Hill Avenue, Lake Street, and St. Thomas More Road east of Boston College, and College Road, Old Colony Road, and Hammond Street west of Boston College. The resulting roadway grid system enables efficient access from regional approaches on all sides of the campus.

The key roadways whose operation affects and is affected by traffic generated from Boston College are on the campus boundaries; namely, Commonwealth Avenue (north), St. Thomas More Drive (east), Beacon Street (south), and College Road (west). The area addressed in this study is confined to within the Boston city limits and, accordingly, includes portions of all of the above-mentioned campus boundary roads with the exception of College Road.

Commonwealth Avenue

Commonwealth Avenue (Route 30) is one of the city of Boston's foremost streets, beginning in downtown and continuing nearly six miles west into Newton. Between the major signalized intersections in Brighton at Chestnut Hill Avenue and at Lake Street, a distance of two-third miles, Commonwealth Avenue is designed with two travel lanes and a parking lane in each direction. The Massachusetts Bay Transportation Authority (MBTA) surface trolley "Green Line" (Boston College "B" branch) is separately located in the median of the roadway. The line terminus station is located immediately west of the Lake Street intersection on the north side of the street. Thus, trains entering or exiting the station travel through the center of the intersection and pass diagonally across the westbound travel lanes of Commonwealth Avenue.

West of Lake Street, Commonwealth Avenue passes through a busy area of on-street parking and pedestrians related to the MBTA station on the north side and Boston College and St. Ignatius Church on the south side of the street. The roadway is channelized with a raised center median, permitting curb parking in this area. Proceeding west beyond the city limits, Commonwealth Avenue divides to a two-way main road, with one travel lane in each direction and parking permitted along the south side, and a separate, minor service or carriage road posted for one-way westbound travel and parking along one side of the street.

Beacon Street

Beacon Street also offers substantial continuity through the Boston area between downtown and Newton. Through Brookline and Brighton, the roadway is designed with two or more travel lanes in each direction and generally permits on-street parking. The MBTA surface trolley "Green Line" (Cleveland Circle "C" branch) runs in the median and terminates at Chestnut Hill Avenue, crossing the eastbound lanes of Beacon Street.

From the signalized intersection at Chestnut Hill Avenue (known as Cleveland Circle) to the Boston/Newton city limits (a distance of approximately one mile), Beacon Street has one through lane in each direction. On-street parking is permitted in the segment of Beacon Street between Chestnut Hill Avenue and the Cleveland Circle Cinema driveway. West of the driveway, on-street parking is prohibited (with posted exceptions for Saturday football games at Boston College). Between Chestnut Hill Avenue and St. Thomas More Drive, Beacon Street abuts the south side of the Chestnut Hill Reservoir.

West of St. Thomas More Drive, Beacon Street abuts the south side of Boston College. There is one travel lane in each direction, a posted speed limit of 30 mph, and attached sidewalk on both sides of the street. The eastbound direction of Beacon Street prohibits parking (with the aforementioned Saturday football game exception), while the westbound direction permits parking except during peak travel hours (4:00 p.m. to 6:00 p.m.) on weekdays.

Beacon Street proceeds west and is intersected by a channelized driveway for Boston College. The roadway continues west and enters Newton at the city limits located between Acacia Avenue (one-way southbound) and Stone Avenue.

The nearest major intersection in Newton is the signalized location at Hammond Street and College Road, approximately one-quarter mile west of the city limits. Hammond Street to the south provides access to Boylston Street (Route 9). The Hammond Street bridge enabling this access was recently reconstructed and reopened (January 1992) by the Massachusetts Highway Department after being closed for structural and safety reasons in November 1989.

St. Thomas More Drive/Chestnut Hill Drive

St. Thomas More Drive and Chestnut Hill Drive form a connector street with a length of approximately one-half mile between Commonwealth Avenue and Beacon Street. The roadway provides one travel lane in each direction. On-street parking is generally prohibited. Within approximately 200 feet south of Commonwealth Avenue, St. Thomas More Drive forms a wide, uncontrolled intersection with Father Herlihy Terrace and Lower Campus Road. Traffic operations in this area are complicated by the presence of numerous pedestrians, a Boston College shuttle bus stop, parking lot entrance, and St. Ignatius Church.

Proceeding south, St. Thomas More Drive forms an unsignalized T-intersection at Chestnut Hill Drive. South of this intersection, the roadway continues as Chestnut Hill Drive. The roadway narrows to a width of 28± feet on a relatively straight and level alignment, abuts the west side of Chestnut Hill Reservoir, and intersects (with a STOP sign) at Beacon Street. The posted speed limit is 20 mph.

Study Area Intersections

The traffic efficiency of the area's roadway system is controlled by the capacity at street intersections, principally at signalized locations and secondarily at the unsignalized intersections of public streets with other streets and campus driveways.

Commonwealth Avenue, Lake Street, St. Thomas More Drive, and Fr. Herlihy Terrace

The only signalized location in the study area, this intersection comprises two parts. Lake Street (to the north) and St. Thomas More Drive (to the south) form a right-angle four-legged intersection with Commonwealth Avenue. However, traffic approaches on only three legs, since Lake Street is designated one-way away (northbound) from the intersection. Eastbound Commonwealth Avenue approaches the intersection with two travel lanes (including a shared left/through lane). In the westbound direction of Commonwealth Avenue are an exclusive left turn lane, two through lanes, and a parking lane. The northbound St. Thomas More Drive approach is sufficiently wide for two travel lanes.

The intersection is signalized with a four-phase actuated controller, with each of the three vehicle approaches assigned a separate phase and the fourth phase serving the MBTA trolley crossing together with the nonconflicting eastbound Commonwealth Avenue through movement. Crosswalks and pedestrian indications are part of this intersection signal for crossing Commonwealth Avenue (east side), Lake Street, and St. Thomas More Drive.

Approximately 100 feet west of St. Thomas More Drive, Father Herlihy Terrace intersects the south side of Commonwealth Avenue. The roadway (35± feet wide) is one-way southbound (away from the intersection). A pedestrian-actuated signal and marked crosswalk are provided for crossing Commonwealth Avenue, immediately west of Father Herlihy Terrace. The pedestrian signal controller is interconnected with the signal controlled at Lake Street.

Each approach of Commonwealth Avenue in this area is utilized as two travel lanes, although there are no pavement markings. As indicated previously, the MBTA station, retail stores, and short-term metered parking ($0.25 per maximum one hour, 8:00 a.m. to

3:00 p.m., except Sunday) combine to make this intersection an area of high pedestrian and vehicle maneuvering activity. Access to an off-street parking area in front of the retail store is via a driveway on Lake Street within 10 feet of the corner of Commonwealth Avenue.

On-street parking is prohibited on Commonwealth Avenue between Father Herlihy Terrace and Lake Street/St. Thomas More Drive.

Beacon Street, Chestnut Hill Drive, and Chestnut Hill Road

Chestnut Hill Drive and Chestnut Hill Road form a STOP sign-controlled intersection at Beacon Street. On the southbound approach is a raised channelization island to separate vehicles turning right. The northbound approach to the intersection is the local residential street Chestnut Hill Road, with directional signing to Gate House Road and Chestnut Hill Terrace.

No separate lane is provided for vehicles turning left from eastbound Beacon Street. The 20±-foot width of eastbound Beacon Street enables through traffic to avoid stopping if left turn vehicles are waiting far enough from the marked yellow centerline on Beacon Street. Otherwise, all traffic in this direction of Beacon Street is stopped. The major intersection approaches (i.e., on Beacon Street and on Chestnut Hill Drive) are designed with a level alignment and offer good sight distance.

St. Thomas More Drive and Chestnut Hill Drive

Chestnut Hill Drive, between St. Thomas More Drive and Commonwealth Avenue, is a curving roadway that borders the north side of the Chestnut Hill Reservoir. At Commonwealth Avenue, all Chestnut Hill Drive traffic must turn right (eastbound).

The roadway forms a STOP sign-controlled T-intersection at St. Thomas More Drive at a point slightly over one-half the distance from Commonwealth Avenue to Beacon Street. Intersection approaches are straight and level. No separate turn lanes are provided on St. Thomas More Drive. The Chestnut Hill Drive approach is channelized with a raised island to separate right and left turn vehicles.

Beacon Street, Boston College driveway, and Reservoir Avenue

Within 600 feet west of St. Thomas More Drive is a primary driveway on Beacon Street for Boston College access. The driveway, which principally accesses the Alumni Stadium parking garage, intersects Beacon Street at a skewed angle and is channelized to separate entry/exit maneuvers. Within 50 feet west of the driveway, Reservoir Avenue (one-way northbound) intersects Beacon Street and is STOP sign-controlled. There is marked crosswalk on Beacon Street between Reservoir Avenue and the Boston College driveway. Beacon Street in the vicinity of the intersection has a width of 45± feet with a double yellow centerline. Beacon Street has no separate lanes for turns into the College. Sight distance is good for all turns.

PARKING

Parking on Lower Campus is open to commuter and resident students, staff, faculty, and visitors. A total of 2,281 spaces are provided within several surface lots, a parking garage, and along Lower Campus Road. The surface lots are accessible from the gates and driveways on St. Thomas More Drive. The garage is accessible only from a driveway located on Beacon Street opposite Reservoir Avenue. The Chestnut Hill campus along with parking areas on Lower Campus, is shown in Figure 4.

Boston College has a stringent policy to limit parking on campus. Key components of this policy are as follows:

- Resident freshman and sophomores are prohibited from having cars on campus.
- Limited parking stickers are issued to resident juniors and seniors.
- Nonresident students purchase parking stickers and may not park on campus overnight.
- Visitor vehicles must be registered at their point of entry to the campus.

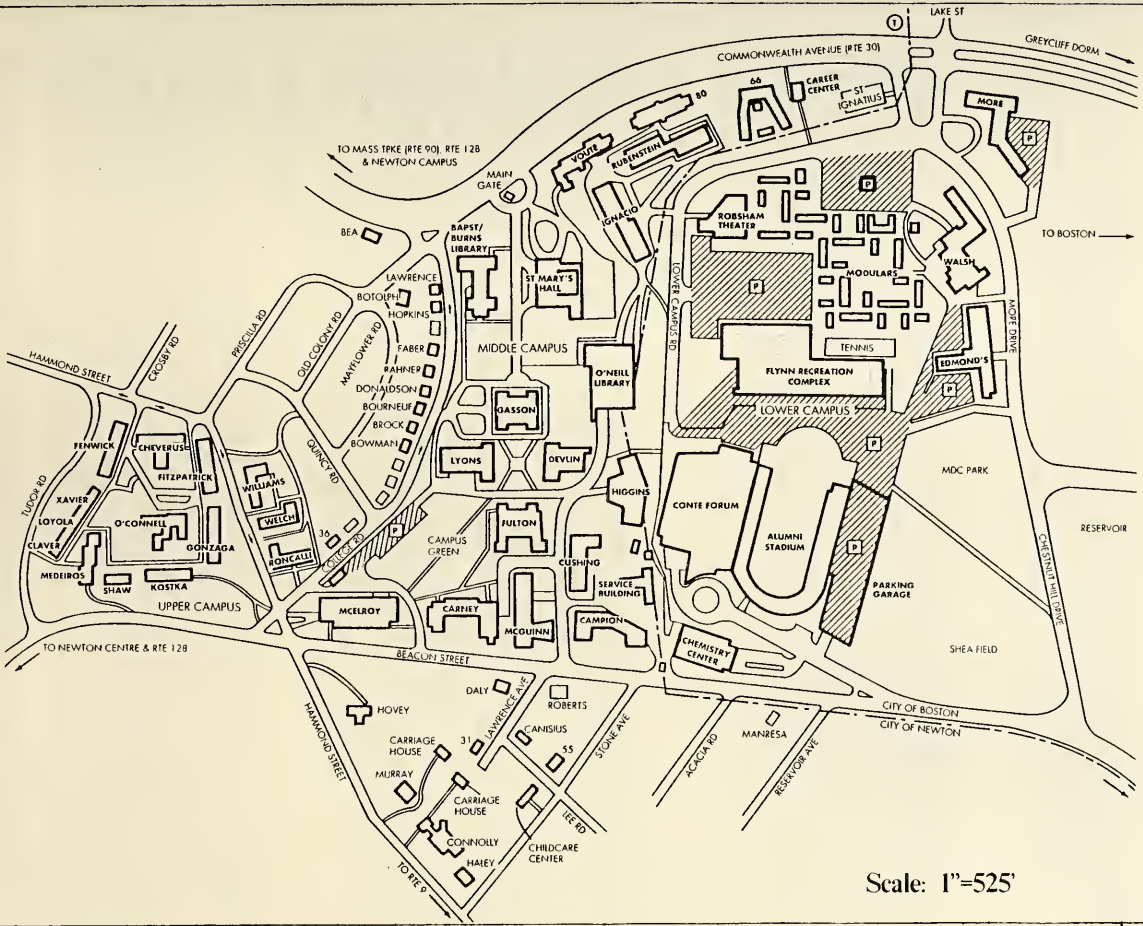
TRAFFIC VOLUMES

Traffic volume counts were obtained to provide a basis for evaluation of existing traffic operations within the study area. Traffic volume data was collected from two sources: (1) automatic traffic recorder (ATR) counts and (2) manual turning movement volume counts.

ATR Counts

ATR counts were taken on Commonwealth Avenue, west of Lake Street, and on Beacon Street, west of Reservoir Avenue. The counts were conducted between Tuesday, February 18 and Friday, February 21, 1992 and were recorded in 15-minute increments for each travel direction.

The daily traffic volumes were adjusted to reflect average annual daily traffic (AADT) conditions. Seasonal and axle adjustment factors were obtained from the Massachusetts Department of Public Works for urban arterial roadways. Daily counts conducted in February are approximately 98 percent of average annual daily volumes; consequently, a factor of 1.02 was applied to the counts to reflect average annual conditions. As ATRs count axles rather than vehicles, ATR counts tend to over count as trucks often have



PARKING

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure 4

more than two axles. To account for this, an axle correction factor of 0.98 was applied to the ATR data. It is apparent that the seasonal and axle factors in this particular case cancel each other. Therefore, the recorded daily traffic volume counts for both Commonwealth Avenue and Beacon Street equal the average annual daily traffic volumes.

The average annual traffic volume on Commonwealth Avenue is approximately 17,200 vehicles per day. The peak hours occur in the morning between 8:00 a.m. and 9:00 a.m. (1,350 vehicles per hour), and in the afternoon between 5:00 p.m. and 6:00 p.m. (1,400 vehicles per hour). The average annual traffic volume on Beacon Street is slightly higher at 18,400 vehicles per day. Peak traffic volumes occur on Beacon Street between 8:00 a.m. and 9:00 a.m. (1,400 vehicles per hour) and 5:30 p.m. and 6:30 p.m. (1,550 vehicles per hour). The predominant traffic flows on both streets are toward Boston for the morning peak hour (70 percent). The flow is equal in both directions for the afternoon peak hour.

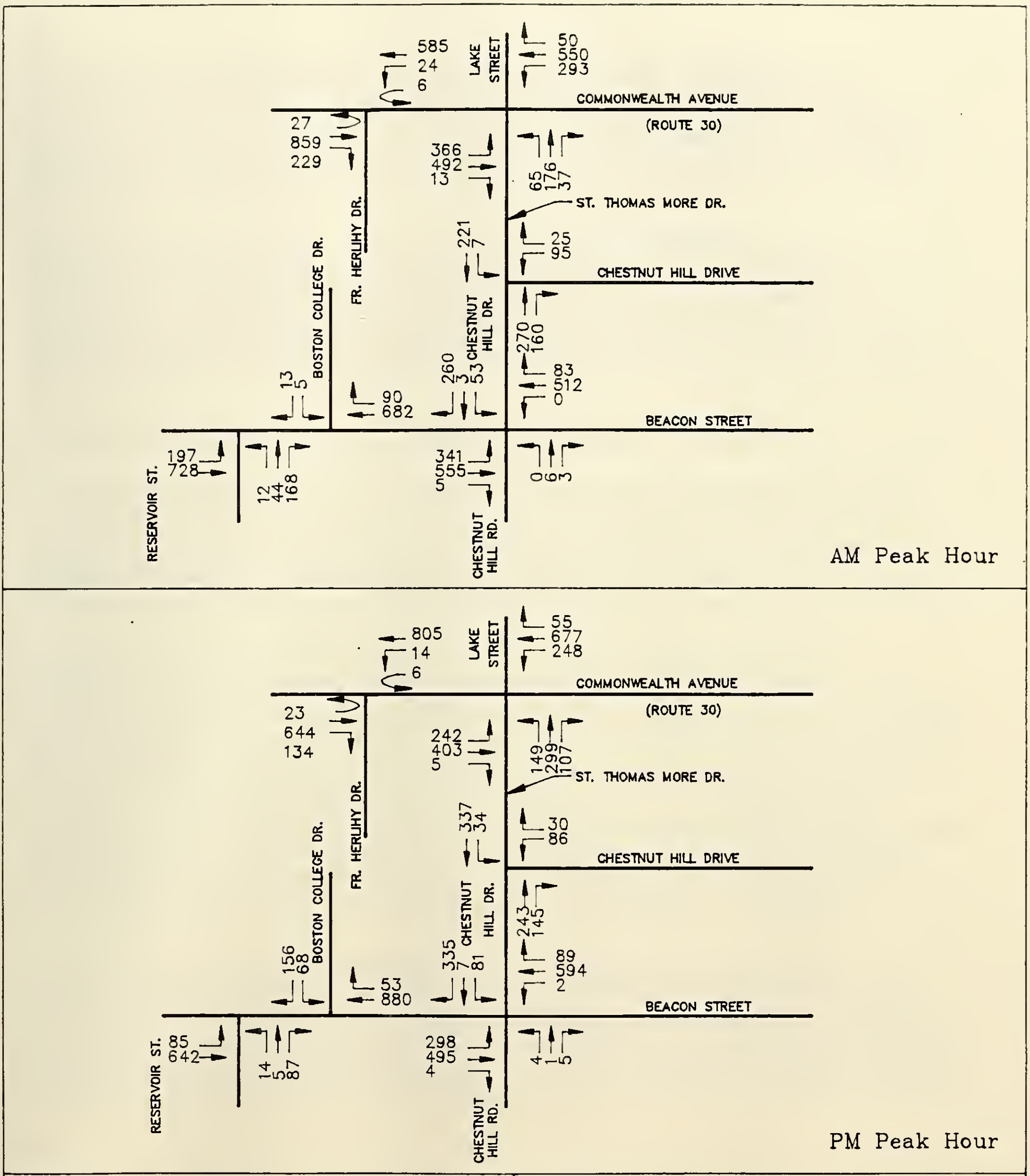
Manual Turning Movement Counts

Manual turning movement counts were conducted at study area intersections during periods encompassing the weekday peak travel hours, namely from 7:45 a.m. to 10:45 a.m. and from 3:45 p.m. to 7:15 p.m. The peak hours represent the highest volume as a total of all intersection approaches during four consecutive 15-minute periods. The counts were recorded in 15-minute intervals. The morning peak hour varied slightly between intersections but generally occurred from 7:45 a.m. to 8:45 a.m. The afternoon peak hour demonstrated greater variation between locations on Beacon Street and on Commonwealth Avenue. At the intersection of Commonwealth Avenue/Lake Street/ Father Herlihy Terrace, the peak hour occurred between 4:30 p.m. and 5:30 p.m. The peak at the Beacon Street intersections occurred an hour later, between 5:30 p.m. and 6:30 p.m. The peak hour traffic volumes are summarized on Figure 5.

PEDESTRIANS

Circulation to and through the Boston College Chestnut Hill Campus occurs from many points. Because of the transit line along Commonwealth Avenue, a great number of pedestrians arrive at the campus through the St. Ignatius gate just south of the Commonwealth Avenue/Lake Street/St. Thomas More Drive intersection. From this point, movement filters through the Lower Campus to dormitories, dining halls, the recreation complex, and the Conte Forum and stadium. Pedestrian traffic to the Middle Campus is more likely to occur along Commonwealth Avenue at the campus perimeter.

Numerous pedestrians cross Commonwealth Avenue walking between the MBTA's Green Line Boston College stop and Boston College. Although a pedestrian traffic signal and crosswalk is provided on Commonwealth Avenue just west of Father Herlihy Terrace, the majority of pedestrians are crossing outside of the crosswalk, opting to cross



Boston College
Lower Campus Project

NORTH

Not to Scale

Figure 5

Peak Hour Traffic Volumes
Existing Conditions (1992)

between St. Thomas More Drive and Father Herlihy Terrace. During the peak pedestrian hour (4:00 p.m. to 5:00 p.m.) over 240 pedestrians cross Commonwealth Avenue outside of the crosswalks. Out of the approximately 35 pedestrians that do use the crosswalk adjacent to Father Herlihy Terrace, only 5 actuate the pedestrian button and wait for the walk signal.

Internal circulation is rather undefined on Lower Campus. Pedestrians crisscross throughout the parking lots and between modular housing units to travel from dormitory to dormitory. Academic destinations on the Middle Campus can be reached by the service roadway connection to the O'Neil Library or by a single staircase at the back of Conte Forum up to the Service Building. In general, pedestrians and cars often occupy the same zone.

ANALYSIS OF EXISTING CAPACITY AND OPERATING EFFICIENCY

To measure quality of traffic flow, intersection capacities were analyzed for the study locations during critical peak travel hours. The key locations that will be significantly affected by the proposed development have been evaluated in terms of the traffic capacity. The analysis was performed in accordance with the guidelines of the *Highway Capacity Manual* (Transportation Research Board, 1985).

The level of service (LOS), an expression of the quality of driving condition, is designated in a range from "A," which provides free flow and no traffic delays, to "F," which involves vehicle backups and traffic jam conditions. Level of service "C," a zone of stable flow characterized by average traffic delays, is a desirable condition for the design of new facilities; however, level of service "D," with somewhat greater delays, may be tolerated for short periods during peak travel times. Level of service "D" is usually considered to be the boundary of acceptable operations in terms of traffic congestion and delays; therefore, roadways are usually designed to attain at least LOS "D". Capacity (level of service "E") represents a condition of maximum possible flow and is controlled by the alignment and cross section design features of a roadway or intersection.

As shown in Table 2, traffic operations at unsignalized intersections are given level of service rankings to and from the minor cross-street traffic movements since the major street flows are considered uninterrupted. The ranking is determined by calculating the reserve capacity for critical traffic movements to and from the minor street. The reserve capacity is defined as the difference between the potential capacity of a traffic movement lane(s) less the actual peak hour traffic flow on it.

TABLE 2

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Available Reserve Capacity (p.c.p.h.)[1]	Level of Service	Expected Delay to Critical Movements
400	A	Little or no delay
300-399	B	Short traffic delay
200-299	C	Average traffic delay
100-199	D	Long traffic delay
0-99	E	Very long traffic delay
0	F	Severe congestion

[1] p.c.p.h. - passenger cars per hour

Source: *Highway Capacity Manual*, Special Report 209. Transportation Research Board (TRB), National Research Council, 1985.

The potential capacity of the minor cross-street traffic movements is dependent on the number of available gaps in the major road traffic flows and the prevailing travel speed. Table 2 summarizes the relationship between reserve capacity, level of service, and expected traffic delay at unsignalized intersections.

Level of service for signalized intersections is defined in terms of the average stopped delay in seconds per vehicle approaching the intersection for the peak 15-minute analysis period of the peak hour. The level of service delay threshold criteria are given in Table 3.

The capacity analysis for existing conditions at the study intersections are summarized in Table 4 and are provided in the Technical Appendix. The results are tabulated in terms of level of service, delay, and available reserve capacity. As seen in Table 4, the operating conditions of the study intersections are generally poor. Capacity deficiencies are prevalent during the peak commuting hours in three of the five study locations

For the two unsignalized intersections on Beacon Street (at Chestnut Hill Drive/ Chestnut Hill Road and Reservoir Road/Boston College driveway) the critical through and left turn exiting movements from the STOP controlled approaches are somewhat restricted due to the volume of through traffic on Beacon Street. These movements are currently operating at or above capacity during the peak commuting hours.

TABLE 3

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

Level of Service (LOS)	Traffic Quality	Stopped Delay Per Vehicle[1] (sec)
A	LOS A occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths also contribute to low delay.	0 to 5.0
B	LOS B generally occurs with good progression and/or short cycle lengths. More vehicles stop than the LOS A, causing higher levels of average delay.	5.1 to 15.0
C	LOS C has higher delays that may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.	15.1 to 25.0
D	At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from combination of unfavorable progression, long cycle length, or high volume to capacity (V/C) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	25.1 to 40.0
E	LOS E is considered to be the limit of acceptable delay in heavily traveled roads and dense commercialized areas. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent.	40.1 to 60.0
F	LOS F is considered to be unacceptable to most drivers. This condition often occurs with over-saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high V/C ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes of such delays.	> 60.0

[1] Average stopped delay per vehicle for a 15-minute analysis period.

Source: *Highway Capacity Manual*, Special Report 209, Transportation Research Board (TRB), National Research Council, 1985.

The unsignalized analysis of Beacon Street/Reservoir Avenue/Boston College driveway assumes that traffic will pass through the intersection randomly on Beacon Street. However, because of the nearby signalized intersection of Beacon Street/ Hammond Street, traffic on Beacon Street will pass Reservoir Avenue and the driveway in platoons, creating additional gaps in traffic to allow motorists to exit from the side streets. Therefore, the intersection will operate at levels of service slightly better than reported in Table 4.

TABLE 4

LEVEL OF SERVICE SUMMARY – EXISTING CONDITIONS (1992)

	AM Peak Hour			PM Peak Hour		
Unsignalized Intersection	**Demand (p.c.p.h.)***	**ARC** (p.c.p.h.)**	**LOS*****	**Demand**	**ARC**	**LOS**
St. Thomas More Drive/Chestnut Hill Drive						
LT onto Chestnut Hill Drive	8	745	A	40	818	A
All movements from Chestnut Hill Drive	141	305	B	132	282	C
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road						
LT onto Chestnut Hill Drive	409	228	C	354	237	C
All movements from Chestnut Hill Road	9	50	E	10	9	E
RT from Chestnut Hill Drive	295	446	A	398	295	C
Th/LT from Chestnut Hill Drive	64	-34	F	105	-66	F
Beacon Street/Reservoir Avenue/Boston College driveway						
LT onto Boston College Drive	236	299	C	107	350	B
LT from Reservoir Avenue	13	49	E	15	33	E
RT from Reservoir Avenue	224	130	D	97	377	B
LT from Boston College Drive	6	+15	E	88	-45	F
Th/RT from Boston College Drive	17	457	A	202	186	D
Commonwealth Avenue/Fr. Herlihy Terrace						
LT onto Fr. Herlihy Terrace	37	239	C	24	434	A
	AM Peak Hour			**PM Peak Hour**		
Signalized Intersection	**V/C+**	**Delay++**	**LOS**	**V/C**	**Delay**	**LOS**
Commonwealth Ave./Lake St./St. Thomas More Drive	0.83	49.2	E	0.96	188.1	F

* p.c.p.h. – passenger cars per hour

** ARC – Available reserve capacity

*** LOS – Level of Service

+ V/C – volume to capacity ratio

+ + Delay – average stopped delay per vehicle in seconds

The signalized intersection of Commonwealth Avenue/Lake Street/St. Thomas More Drive is operating at capacity during the morning peak hour and over capacity during the afternoon peak hour. Significant delays to westbound vehicular traffic results from the MBTA trolley crossing at this intersection. In addition, the existing signal phasing is not efficient and the signal timings are restrictive to the St. Thomas More Drive and Commonwealth Avenue westbound approaches to the intersection.

PUBLIC TRANSPORTATION SYSTEM

Boston College is served by two transportation agencies: the Massachusetts Bay Transportation Authority (MBTA) and Crystal Transportation. The MBTA has trolley line service between Boston College and downtown Boston. Crystal Transportation has been contracted by Boston College to serve the two campuses of Boston College (the Chestnut Hill Campus and the Newton Campus) and the Cleveland Circle area, which houses many off-campus students. The services provided by these agencies are documented below along with existing ridership and capacity data.

MBTA. The MBTA Boston College branch of the Green Line has its westerly terminus at the Boston College stop, located at the intersection of Commonwealth Avenue and Lake Street, opposite the Lower Campus main gate. The trolley travels within the median of Commonwealth Avenue. Service is provided daily between 5:00 a.m. and 12:30 a.m. The trolleys arrive and depart the Boston College stop approximately every 7 minutes, and travel time to downtown Boston is approximately 35 minutes. Based on a 280 passenger capacity per car and two cars per trolley, the capacity of the trolley is 2,400 passengers per hour.

The most recent count data available from the MBTA indicates that the Boston College stop serves 2,000 inbound trips per day and 1,700 outbound trips per day. Peak hour counts indicated the following:

- The highest number of passengers boarding and disembarking in the morning occurs between 8:00 and 9:00 a.m.: 307 passengers board and 184 disembark.
- The peak activity in the afternoon occurs approximately between 5:00 and 6:00 p.m.: 162 board and 160 disembark.

Comparing the peak hour passenger volumes to actual train capacity indicates that when the trolley arrives and departs the Boston College stop it is utilized well below its available capacity. Table 5 summarizes the volume to capacity ratios for the morning and afternoon peak hours for both inbound and outbound trips.

Boston College Bus Service. Crystal Transportation provides bus services for Boston College between 7:00 a.m. and 2:00 a.m. during the week and between 8:00 a.m. and 2:00 a.m. on weekends.

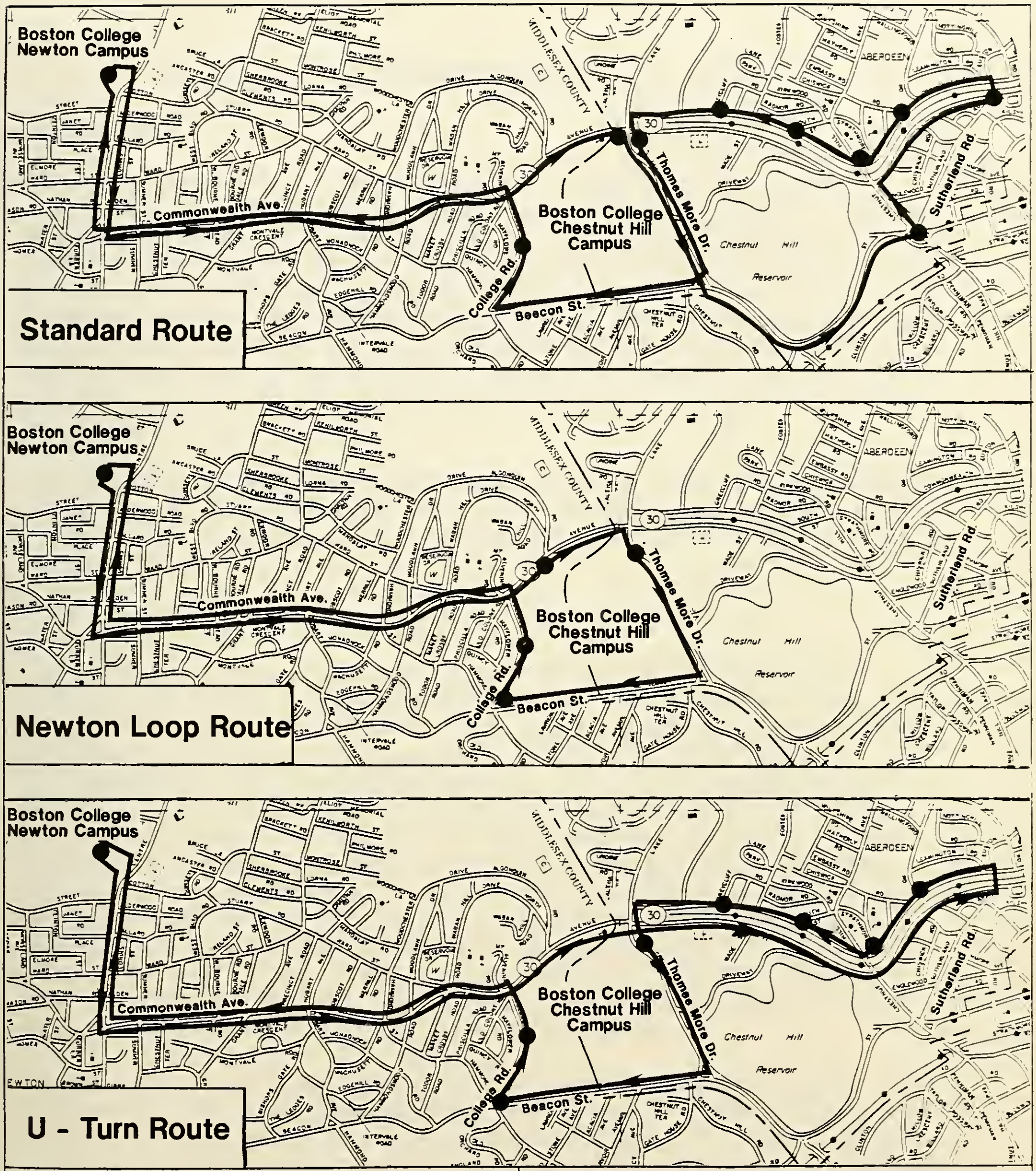
TABLE 5

MBTA BOSTON COLLEGE GREEN - LAKE STREET STOP
SUMMARY OF VOLUME TO CAPACITY RATIOS
EXISTING CONDITIONS (1992)

AM Peak Hour		PM Peak Hour	
Inbound Trolley	Outbound Trolley	Inbound Trolley	Outbound Trolley
0.13	0.08	0.07	0.06

The Boston College bus follows a circuitous route beginning at the Newton Campus located on Centre Street as shown on Figure 6. Buses generally run every 8 to 10 minutes during the weekday between the hours of 8:00 a.m. and 6:00 p.m. The bus makes three stops as it travels around the Chestnut Hill campus. As indicated on Figure 4, the stops are located on St. Thomas More Drive, Beacon Street, and College Road. Based on counts conducted in October 1990 by Alternative Concepts, Inc., between 450 and 600 passengers per day board the buses at each of these stops.

In addition, buses with shorter routes are added during peak travel demand periods (approximately 8:15 a.m. to 10:00 a.m.) to serve students traveling between residential and academic areas. These additional routes, called the U-Turn route and the Newton route, are also shown on Figure 6.



Boston College
Lower Campus Project

NORTH

0 2000
Scale in Feet

Base Map: MDPW Urban Area Series Map

Figure 6

Boston College Bus Routes

● **Bus Stop**

PROJECT TRAFFIC

GENERAL

This section determines the amount of traffic generated by the project and the distribution of the traffic on adjacent roadways and intersections. Traffic generation is defined as the number of vehicle movements that may reasonably be expected to be produced or attracted by a development and is normally expressed as a number of trips. It is more commonly referred to as trip generation. A trip is a one-way vehicle movement to or from the specific location. (Thus, one vehicle that enters and then exits Boston College would equal two trips). Trip generation is typically performed for an average weekday and for the morning and afternoon peak commuting hours. For the project study area, the peak hours occur from 8:00 a.m. to 9:00 a.m. and from 5:00 p.m. to 6:00 p.m.

Distribution of project generated trips is based on a variety of factors. For this project, the distribution of trips will be determined, as appropriate, by evaluation of the home zip codes of students and employees of the college and/or analysis of the peak hour turning movement counts.

TRIP GENERATION

This project involves the construction of two dormitories and a dining hall facility, demolition of 7 existing modular housing buildings, and the closure of the Walsh Hall cafeteria. The Institute of Transportation Engineers has compiled, in their publication *Trip Generation* manual (Fifth Edition, 1991), a comprehensive list of land use developments and their associated traffic volumes. Typically, the methodology for determining site traffic is to select the appropriate development use category from the *Trip Generation* manual and then apply the trip generation rates appropriate for this project. However, the *Trip Generation* manual does not contain any data applicable to this project. The trip generation rate for a university contained in the manual is based on student enrollment. As previously stated, Boston College has a commitment to the community that student enrollment will remain at approximately 14,000. This project provides additional on-campus housing and an additional dining facility and will not increase enrollment. Therefore, a methodology uniquely suited for this project was developed to determine the total trips generated by the project.

The methodology involves a three-step process to determine the net increase (or decrease) in traffic to/from Boston College. First, the number of trips generated by the two new dormitories and the new dining facility were estimated. Second, an analysis is made of the trips eliminated by the project. This includes trips eliminated as a result of demolishing the modular housing buildings, by the closure of the Walsh Hall cafeteria, and by students who will move into the new dorms and will no longer commute to

Boston College. Lastly, the eliminated trips are subtracted from the new trips to determine the total trips produced by the project.

New Trips - Dormitories

The two proposed dormitories will house 734 student beds and 22 resident advisor beds. Traffic will be generated by the students, resident advisors, visitors, housekeeping staff, and service vehicles.

Students. Boston College currently plans to occupy the new dorms with undergraduate sophomores. Resident sophomores at Boston College are not issued parking stickers; therefore, these students will not have cars on campus and will not directly generate any new trips.

Resident Assistants. As part of the mitigation program for this project, Boston College administration is considering eliminating resident assistant parking stickers for the entire college campus. However, as this policy has not yet been implemented, it is conservatively assumed that approximately one half of the 22 resident assistants will have access to parking stickers and will have a car on campus. It is further assumed that half of the resident assistants with stickers will make one trip departing the campus during the morning peak hour and one trip entering the campus during the afternoon peak hour. The remainder will make two trips during the off-peak hours.

Visitors. The residents of the dorms will receive visitors such as relatives, friends, and individuals picking up and dropping off resident students. Most visitors will walk to the dorms and will not arrive by car. However, it is assumed that 2 percent of the students will have visitors arriving and departing during the morning and afternoon peak hours by vehicle and that 10 percent will have visitors arriving and departing by vehicle during the off-peak hours.

Housekeeping Staff. Boston College projects that four employees will be hired to clean the new dormitories. The existing housekeeping staff works on a shift from 7:00 a.m. to 3:30 p.m. and typically arrives on campus between 6:30 a.m. and 6:45 a.m. These four new employees will work the same shift as the existing staff; therefore, no increase in trips during the peak hours is caused by the new employees.

Service Vehicles. It is estimated that three trucks providing daily trash, maintenance, and supply services will make one trip to and from each dormitory during off-peak periods.

New Trips - Dining Hall Facility

The new dining hall facility will contain an 800-seat cafeteria and a 305-seat function room. The facility will be open from 7:30 a.m. to 2:30 a.m. on Thursday, Friday, and

Saturday and from 7:30 a.m. to midnight on all other days. Trip generation for the dining hall facility includes evaluation of the cafeteria, the function room, staff, and vendors/visitors.

Cafeteria. Based on discussions with the Boston College Dining Hall Director, the students served at this cafeteria will include approximately 95 percent resident students and 5 percent nonresident students. It is further assumed that both the resident students and nonresident students will walk to the dining hall. Nonresident students will not drive to Boston College solely to eat at the dining hall. Rather, it is more likely that they will walk to the dining hall between classes for a meal. Therefore, the 800 student seats will not directly generate any new student traffic on the roadways surrounding Boston College.

Function Room. Most of the functions that will be held in the new facility are currently held in other less desirable locations on the campus. However, it is anticipated by Boston College that approximately two additional functions may be held each week on campus as a result of the new facility. These will most likely be "pre-event functions" such as dinner before a sports event and may occur on a weekday or weekend evening. In many cases the guest would simply arrive earlier (during the peak hour) rather than just prior to the event. To be conservative, the trip generation will reflect an evening when an additional function is held. The following assumptions are used to determine the trip generation for the function room:

- All 305 seats will be occupied during an evening event.
- Seventy-five percent of all seats will be occupied by individuals arriving on campus by car. One-half will arrive alone and one-half will arrive with one other person. Twenty percent of all seats will be occupied by individuals arriving on foot from on or off-campus locations, and the remaining five percent will be occupied by individuals arriving by "T".

Staff. The new dining hall facility will require 67 permanent and 300 part-time student employees. Approximately 52 permanent employees will work each day from 6:00 a.m. to 4:00 p.m. The manager and 60 part-time employees will work from 4:00 p.m. to 2:30 a.m. These employees will serve students as well as work at functions. Based on the work shift of the full-time employees, it is assumed that the employees will not generate new traffic during the peak hours.

Almost all of the existing student employees of the Walsh Hall cafeteria walk to work. It is estimated that approximately two percent of the students drive to work. Applying these percentages for the new facility, approximately four trips per day will be generated by the 60 part-time student employees.

Vendors and Visitors. Currently, approximately 25 vehicles each day (typically trucks) arrive and depart the existing Walsh Hall facility for food, chemical, and trash service. This includes a few trips by management staff. It is estimated that for the new facility the number of trips will remain the same; however, the size of the trucks will increase. More tractor-trailers, rather than single-unit trucks, will be hauling food and supplies to the new dining facility. As with the existing facility, these trips will occur between 7:00 a.m. and 11:00 a.m. with approximately one-fourth occurring during the morning peak hour.

A summary of the new trips generated by the proposed project is shown in Table 6.

TABLE 6

SUMMARY OF NEW TRIPS

	Average Weekday Trips	**Peak Hours**					
		AM Peak Hour			**PM Peak Hour**		
		In	**Out**	**Total**	**In**	**Out**	**Total**
Dormitories							
Students	0	0	0	0	0	0	0
Resident Assistants	22	0	6	6	6	0	6
Visitors	176	15	15	30	15	15	30
Housekeeping Staff	8	0	0	0	0	0	0
Service Vehicles	6	0	0	0	0	0	0
Dining Hall Facility							
800 student seats	0	0	0	0	0	0	0
305 function room seats	342	0	0	0	171*	0	171*
Staff	106	0	0	0	0	0	0
Vendors and Visitors	50	6	6	12	0	0	0
Total New Trips	710	21	27	48	192	15	207

* These trips will only occur if a new function is held on campus. It is anticipated that on a worse case basis two new functions will be held per week.

Eliminated Trips - Modular Housing Buildings

Trips associated with the modular housing buildings are generated by students, visitors, and staff.

Students. The modular housing buildings are generally occupied by seniors and some juniors. Approximately 15 percent of juniors and seniors have parking stickers allowing 24-hour parking privileges on campus. Thus, it is estimated that, of the 120 students in the modular buildings, 18 have vehicles on campus.

Many of the juniors and seniors that are able to obtain parking stickers are student teaching or student nursing and have a strong need for a vehicle. Therefore, it is assumed that a fairly high percent of these students (75 percent) will leave the campus during the morning peak hour and will return during the afternoon peak hour. The remaining 25 percent will leave and return to campus once during off-peak hours.

Visitors. Students in the modular housing units receive visitors such as relatives and friends. Also included as visitors are individuals who arrive to pick up or drop off residents. It is assumed that approximately 2 percent of the students receive visitors arriving/departing by vehicle during the morning and afternoon peak hours and that 10 percent receive visitors during off-peak periods arriving/departing by vehicle.

Staff. The modular buildings are treated as apartment buildings and are cleaned by the students during the school years. Therefore, there are no trips to these buildings by Boston College housekeeping staff.

Eliminated Trips - Walsh Hall Cafeteria

The existing cafeteria at Walsh Hall has a student seating capacity of 305. The primary purpose of this facility is to serve students living on campus. No functions are held at this facility as the cafeteria is open to the students until 9:30 p.m. A small adjacent meeting room, with a 40-seat capacity, is used occasionally by students and facility.

Traffic generated by the cafeteria includes trips by students, staff, and vendors/visitors.

Students. Almost all students who eat at Walsh Hall cafeteria live in on-campus housing. Seats are limited and the space is not particularly appealing. Therefore, students with alternatives for dining, such as students living off-campus, will generally not eat at the Walsh Hall cafeteria. It is estimated that less than five percent of the patrons of Walsh Hall are nonresidents. Therefore, to be conservative, we are assuming that no student trips are generated by the facility.

Generally, the small meeting room is used for student activities in the evening. Small luncheon meetings are held during the day for visitors to the campus such as recruiters. Approximately twice a month breakfast functions are held. Because most of these activities involve students or visitors who are already on campus, it is assumed that no trips are directly generated by the activities of this room.

Dining Hall Employees. Forty permanent employees and 150 part-time student employees are assigned to Walsh Hall cafeteria. Thirty-five full-time employees work each weekday, with approximately 60 percent working from 6:00 a.m. to 2:30 p.m. and 40 percent working from 12:00 p.m. to 8:30 p.m. Thus, the employees of the dining hall do not generate traffic during the morning or afternoon peak hours.

Approximately 10 percent of the dining hall employees use the "T" to commute to work, and all student employees walk to work.

Vendors and Visitors. Between 7:00 a.m. and 11:00 a.m. approximately 25 trips are made to and from Walsh Hall by trucks bringing food, chemicals, clean laundry, and paper, as well as by one BFI truck picking up trash. Visitors are generally management staff from Boston College Dining Services. Typically, three visitor trips to and from Walsh Hall are made per day. It is assumed that one quarter of the vendor and visitor trips occur during the morning peak hour.

Eliminated Trips - Reduction of Commuter Students

As a result of the proposed project an additional 614 student beds (net increase) will be available on campus. Thus, 614 students who currently commute to school either from off-campus apartments or from home will live on campus in 1996. The result is a reduction of Boston College commuter student traffic. A detailed analysis of the volume of student parking stickers issued for the 1991/1992 school year and the peak hour counts at each of the gates serving Lower Campus provided the basis to estimate the number of trips eliminated during the morning and afternoon peak hours.

A summary of the data and calculations used for this analysis is presented in Table 7. As indicated in the table, approximately 86 entering and 37 exiting trips will be eliminated during the morning and afternoon peak hours, respectively.

A summary of the trips eliminated by the demolition of the modular housing buildings, the closure of the Walsh Hall cafeteria, and the reduction of commuter students is presented in Table 8.

Total Trips

The total project trips are determined by subtracting the eliminated trips from the new trips. As shown in Table 9, the daily number of trips and the total afternoon peak hour trips will increase while an overall decrease in trips will result during the morning peak hour.

TABLE 7

TRIPS ELIMINATED BY COMMUTER STUDENTS RECEIVING ON CAMPUS HOUSING

	Average Weekday Trips	AM Peak Hour	PM Peak Hour
Total nonresident undergraduate students	2,707		
Total nonresident undergraduate trips[1]		267 (In)	167 (Out)
Percent of nonresident undergraduate students making trips during peak hours		(267/2,707) × 100 = 14%	(167/2,707) × 100 = 6%
Total nonresident undergraduate students with commuter parking stickers	1,076		
Percent commuter students driving to school each day	(1,076/2,707)×100 = 39%		
Trips eliminated by commuting students moving into new dormitories	(0.39×614)×2 = 478	0.14 × 614 = 86	0.06 × 614 = 37

[1] Based on peak hour turning movement counts at gates serving Lower Campus

TABLE 8

SUMMARY OF ELIMINATED TRIPS

	Average Weekday Trips	Peak Hours					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Modular Housing Buildings							
Students	36	0	14	14	14	0	14
Visitors	28	3	3	6	3	3	6
Walsh Hall Cafeteria							
Students	0	0	0	0	0	0	0
Staff	64	0	0	0	0	0	0
Vendors and Visitors	50	6	6	12	0	0	0
Commuter Students	488	86	0	86	0	37	37
Total Trips Eliminated	666	95	23	118	17	40	57

TABLE 9

TRIP GENERATION SUMMARY

	Average Weekday Trips	Peak Hours					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
New Trips	710	+21	+27	+48	+192	+15	+207
Eliminated Trips	-666	-95	-23	-118	-17	-40	-57
Total Trips	44	-74	+4	-70	175	-25	+50

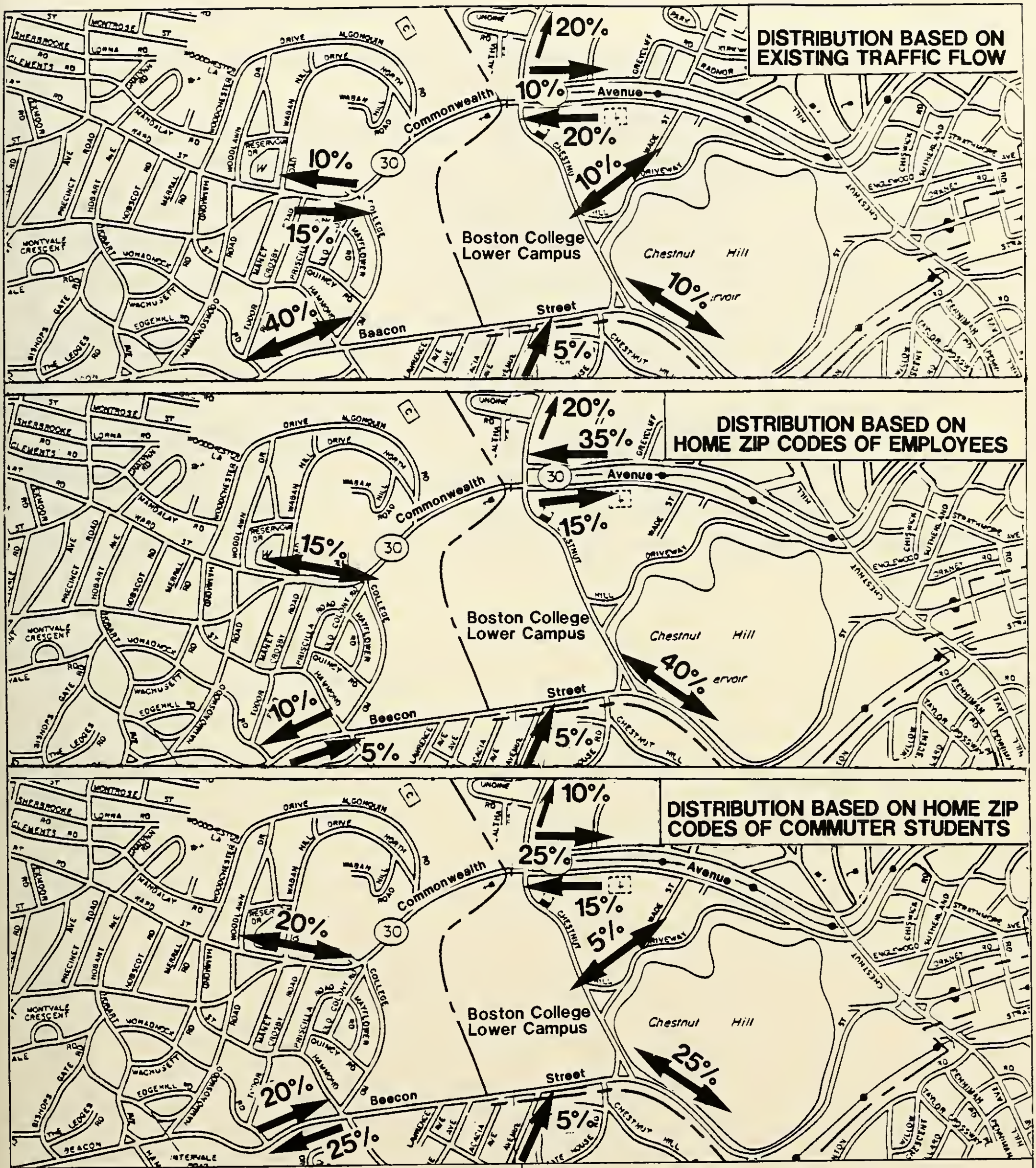
RIDERSHIP ON PUBLIC TRANSPORTATION

The number of riders on the MBTA Green Line and the Boston College shuttle bus will also be impacted by this project. The ridership will decrease as 614 students who currently commute will move into the new dormitories. Approximately 39 percent of all undergraduate nonresident students are issued commuter parking stickers. Therefore, the remaining 61 percent either walk, use public transportation, or share a ride with another student. For planning purposes we will assume that 15 percent walk and/or share a ride. The remaining 46 percent use public transportation. Thus, approximately 280 commuter students currently using the Green Line or Boston College shuttle bus to travel to Boston College will be eliminated.

The net increase in employees traveling each weekday to Boston College as a result of this project is 21 (4 housekeeping staff and 17 dining hall employees). Currently, 10 percent of the dining hall staff uses the MBTA Green Line to commute to work. Therefore, approximately 2 new employees will use the "T" to commute to Boston College.

PROJECT TRIP DISTRIBUTION

Assignment of the new and eliminated trips to the study area roadways and intersections was based on three separate distribution studies. These included analyses of existing peak hour traffic volumes, residence locations of commuter students, and residence locations of Boston College employees. The results of each of these analyses is presented in Figure 7. Table 10 summarizes, for each component of the project that generates trips during the peak hours, the distribution used to assign the trips to the study area roadway network. The resulting project related peak hour traffic volumes are shown on Figure 8.



DISTRIBUTION BASED ON EXISTING TRAFFIC FLOW
20%
10%
20%
10%
10%
15%
40%
10%
5%
Commonwealth
Avenue
Beacon
Street
30
Boston College Lower Campus
Chestnut Hill
DISTRIBUTION BASED ON HOME ZIP CODES OF EMPLOYEES
20%
35%
15%
15%
10%
5%
40%
5%
Commonwealth
Avenue
Beacon
Street
30
Boston College Lower Campus
Chestnut Hill
DISTRIBUTION BASED ON HOME ZIP CODES OF COMMUTER STUDENTS
10%
25%
15%
5%
20%
20%
25%
25%
5%
Commonwealth
Avenue
Beacon
Street
30
Boston College Lower Campus
Chestnut Hill

Boston College
Lower Campus Project

NORTH

0 1,500
Scale in Feet

Base Map: MDPW Urban Area Series Map

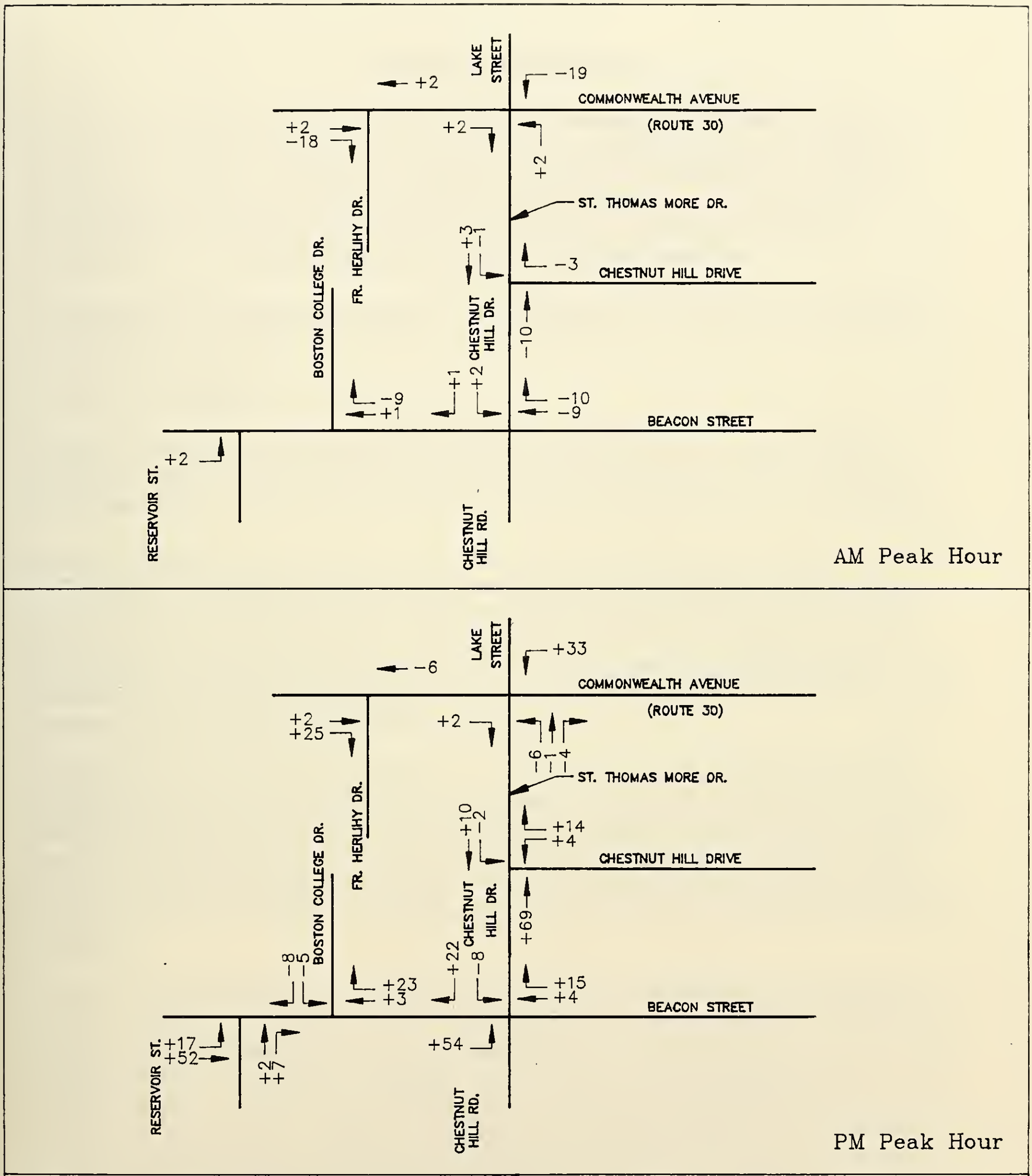
Figure 7

Distribution Summary

TABLE 10

PROJECT TRAFFIC DISTRIBUTION SUMMARY

Project Component	Distribution
New Dormitories – Resident Assistants	Analysis of peak hour traffic volumes
New Dormitories – Visitors	Analysis of peak hour traffic volumes
New Dormitories – Staff	Analysis of residence locations of existing Boston College staff
New Dining Hall – Function Room Attendees	Analysis of peak hour traffic volumes
New Dining Hall – Staff	Analysis of residence locations of existing Boston College staff
Eliminated Modular Housing – Students	Analysis of peak hour traffic volumes
Eliminated Modular Housing – Visitors	Analysis of peak hour traffic volumes
Eliminated Commuter Students	Analysis of residence locations of undergraduate commuter students



Boston College
Lower Campus Project

NORTH

Not to Scale

Figure 8

Project Traffic

FUTURE CONDITIONS

The following sections describe future traffic conditions on the study area roadway network that are anticipated to occur by 1996 with or without the proposed dormitories or dining hall facility. Although the project is scheduled to be complete by 1993, the City of Boston Scoping Determination document requires that traffic conditions be evaluated for 1996. Future land uses, traffic volumes and traffic operations are evaluated for the No-Build (without the project) and Build condition.

This section also addresses the impacts to the parking lots on Lower Campus impacted by the proposed project.

TRAFFIC GROWTH

Growth in traffic between the present and 1996 is predicted by 1) determining the general increase in background through traffic within the study area and 2) estimating traffic generated by other specific projects currently planned for the Chestnut Hill area.

Based on discussions with the Boston Transportation Department and review of previous traffic studies, it is estimated that background traffic will increase by one percent per year. Thus, the existing peak hour traffic volumes are increased by a factor of 1.04 to reflect the four-year period between 1992 and 1996. It should be noted that traffic has been stable for some time in the Chestnut Hill area and has not been increasing. However, the growth factor is applied to account for the possibility that the economy will improve by 1996, resulting in increased traffic levels.

In determining what off-site projects are currently planned for the Chestnut Hill area, discussions were held with officials from the Boston Transportation Department, the Newton Planning Department, and Boston College. Currently, three new projects (other than the new dormitories and dining hall facility) are proposed for the Chestnut Hill area. Two of these projects are located on the Boston College Lower Campus, and the third is located at the MWRA (Massachusetts Water Resources Authority) water works buildings.

Boston College anticipates constructing a new student center and a new parking garage prior to 1996. The proposed site for the student center is located between Middle Campus (O'Neil Library) and Lower Campus (Flynn Recreation Center) on the Boston/ Newton city line. The student center will contain approximately 90,000 square feet. The primary function of the center is to relieve overcrowding at the existing undersized student center on Middle Campus. The primary users of this center will be students. It is anticipated that approximately 45 new full-time employees will hired to administrate, clean, and provide food services at the student center. Students visiting the center will not generate any new trips as they will either be students that live on campus or commuter students that are already on campus.

As discussed previously within the report, approximately 10 percent of Boston College staff employees use the "T" to commute to work. Thus, the student center may increase ridership by 4 trips during peak commuting hours.

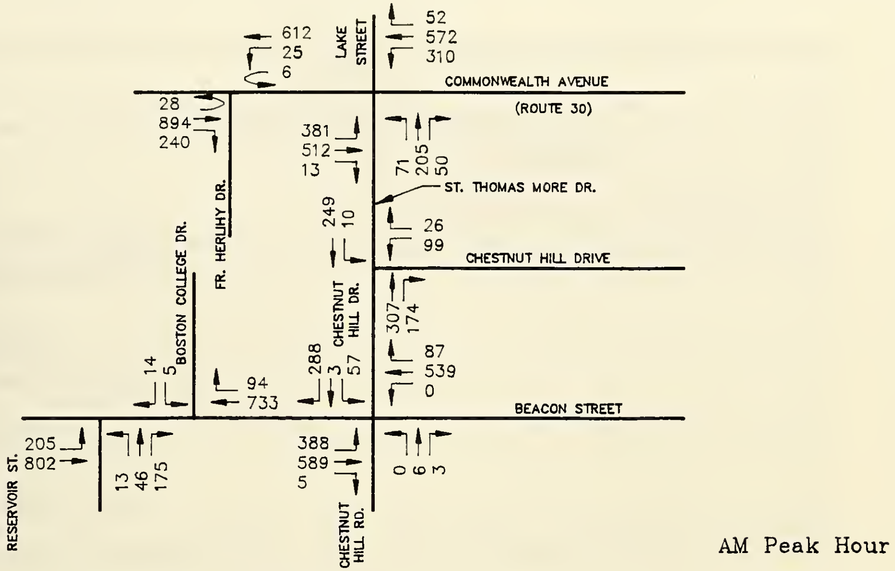
An 800-car parking garage is also proposed for the area between Lower and Upper Campus. The parking garage will be located adjacent to the north side of the proposed student center. The function of this garage is to alleviate existing parking deficiencies on Lower Campus, as well as to provide replacement for parking eliminated by the construction of the new dormitories and dining hall. Boston College has made a commitment to the neighborhood Master Plan Task Force that, upon completion of the garage, 200 new resident stickers will be issued. The objective of these new stickers is to relieve overnight parking on residential streets adjacent to Boston College. It is assumed that approximately 75 percent of these students will park in the garage and the remaining 25 percent will find parking on Lower Campus. Also, it is estimated that half of the students will make trips during the peak commuting hours. As no new commuter stickers will be issued, the remaining 300 spaces are replacement spaces and will not generate any new traffic.

The new parking garage will have no impact on "T" ridership as the number of commuter students will remain the same.

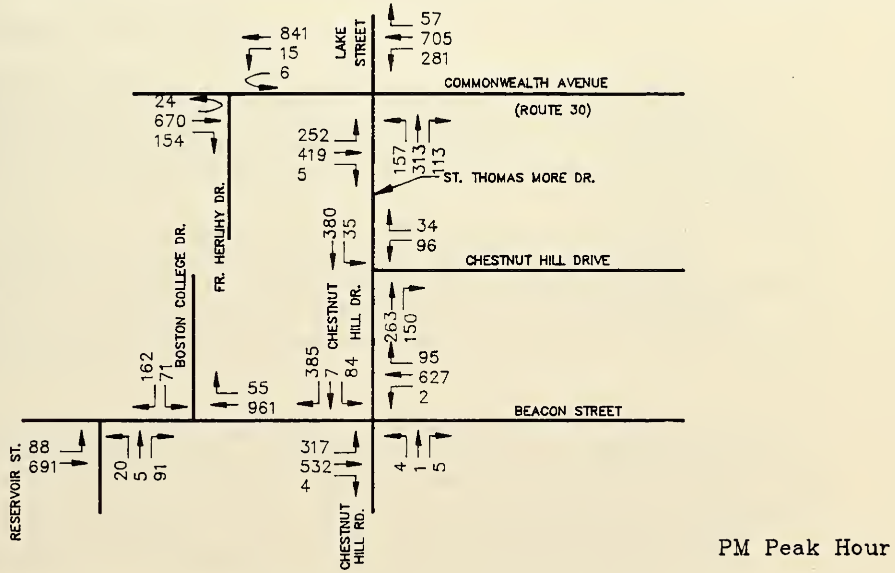
The MWRA is proposing renovations for its existing buildings located on Beacon Street between Boston College and Cleveland Circle. The renovations will provide space for pumping, electronics, laboratory, and distribution staff. Approximately 67 MWRA employees will be assigned to these buildings. Discussions with MWRA planning personnel indicate that most of the employees will work on a 7:00 a.m. to 4:00 p.m. shift. The Notice of Project Change submitted to the MEPA indicates that, as a result of the MWRA shifts, only 2 new trips are generated during the morning peak hour (8:00 a.m. to 9:00 a.m.) and no trips are generated during the afternoon peak hour (5:00 p.m. to 6:00 p.m.). MWRA employees who may use public transportation to commute to work would most likely use the Cleveland Circle branch of the Green Line and would have no impact upon the Boston College branch of the Green Line.

A summary of these three projects, together with their estimated trip generation characteristics, is presented in Table 11.

The resulting 1996 No-Build traffic volumes for the morning and afternoon peak hours are presented on Figure 9. With the increase in through traffic and the additional traffic generated by other developments, the existing traffic volumes of 1992 will increase by approximately 6 percent throughout the study area by 1996.



AM Peak Hour



PM Peak Hour

Boston College
Lower Campus Project

NORTH

Not to Scale

Figure 9

Peak Hour Traffic Volumes
No – Build Conditions (1996)

TABLE 11

BACKGROUND DEVELOPMENTS

Project Description	Peak Hours					
	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Boston College Campus Center 90,000 gsf 45 new employees	15	5	20	5	15	20
Boston College Parking Garage 800 spaces	0	100	100	100	0	100
MWRA Water Works Buildings Restoration Project	1	0	1	0	0	0
Total Trips	16	105	121	105	15	120

FUTURE OPERATING CONDITIONS

Future Operating Conditions - No-Build. Under the future No-Build condition, peak hour volumes (shown on Figure 9) include only existing (1992) traffic, background growth, and traffic generated other proposed projects in the area. Table 12 summarizes the results of capacity analyses performed for the study locations under this condition.

As seen in Table 12 the 6 percent increase in traffic volumes results in slightly worsened operating conditions at the study intersections by 1996. The intersections of Commonwealth Avenue/Lake Street/Thomas More Drive, Beacon Street/Chestnut Hill Drive/Chestnut Hill Road, and Beacon Street/Reservoir Avenue/Boston College driveway operate under deficient conditions for both the existing and No-Build condition. No significant decreases in capacity result.

Public Transportation - No-Build Condition. Assuming that an increase of 4 percent in ridership of the Green Line occurs by 1996 and capacity remains unchanged (two-car trolleys every 7 minutes) the volume to capacity ratios during the peak commuting hours increase slightly from the existing ratios. The ratios are summarized for the inbound and outbound trollies for both peak hours in Table 13. The Green Line remains highly under utilized at Lake Street during peak hours for the 1996 No-Build condition.

TABLE 12

LEVEL OF SERVICE SUMMARY - NO-BUILD CONDITIONS (1996)

Unsignalized Intersection	AM Peak Hour			PM Peak Hour		
	Demand (p.c.p.h.)*	ARC** (p.c.p.h.)	LOS***	Demand	ARC	LOS
St. Thomas More Drive/Chestnut Hill Drive						
LT onto Chestnut Hill Drive	11	805	A	42	792	A
All movements from Chestnut Hill Drive	147	312	B	148	226	C
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road						
LT onto Chestnut Hill Drive	466	149	D	377	190	D
All movements from Chestnut Hill Road	9	24	E	10	-1	F
RT from Chestnut Hill Drive	327	391	B	457	209	C
Th/LT from Chestnut Hill Drive	68	-52	F	108	-82	F
Beacon Street/Reservoir Avenue/Boston College driveway						
LT onto Boston College Drive	301	197	D	111	299	C
LT from Reservoir Avenue	14	30	E	21	13	E
RT from Reservoir Avenue	234	79	E	102	339	B
LT from Boston College Drive	6	4	E	92	-62	F
Th/RT from Boston College Drive	18	421	A	210	135	D
Commonwealth Avenue/Fr. Herlihy Terrace						
LT onto Fr. Herlihy Terrace	38	218	C	24	406	A

Signalized Intersection	AM Peak Hour			PM Peak Hour		
	V/C+	Delay++	LOS	V/C	Delay	LOS
Commonwealth Ave./Lake St./St. Thomas More Drive	0.89	65.2	F	1.00	243.5	F

* p.c.p.h. - passenger cars per hour

** ARC - Available reserve capacity

*** LOS - Level of Service

+ V/C - volume to capacity ratio

++ Delay - average stopped delay per vehicle in seconds

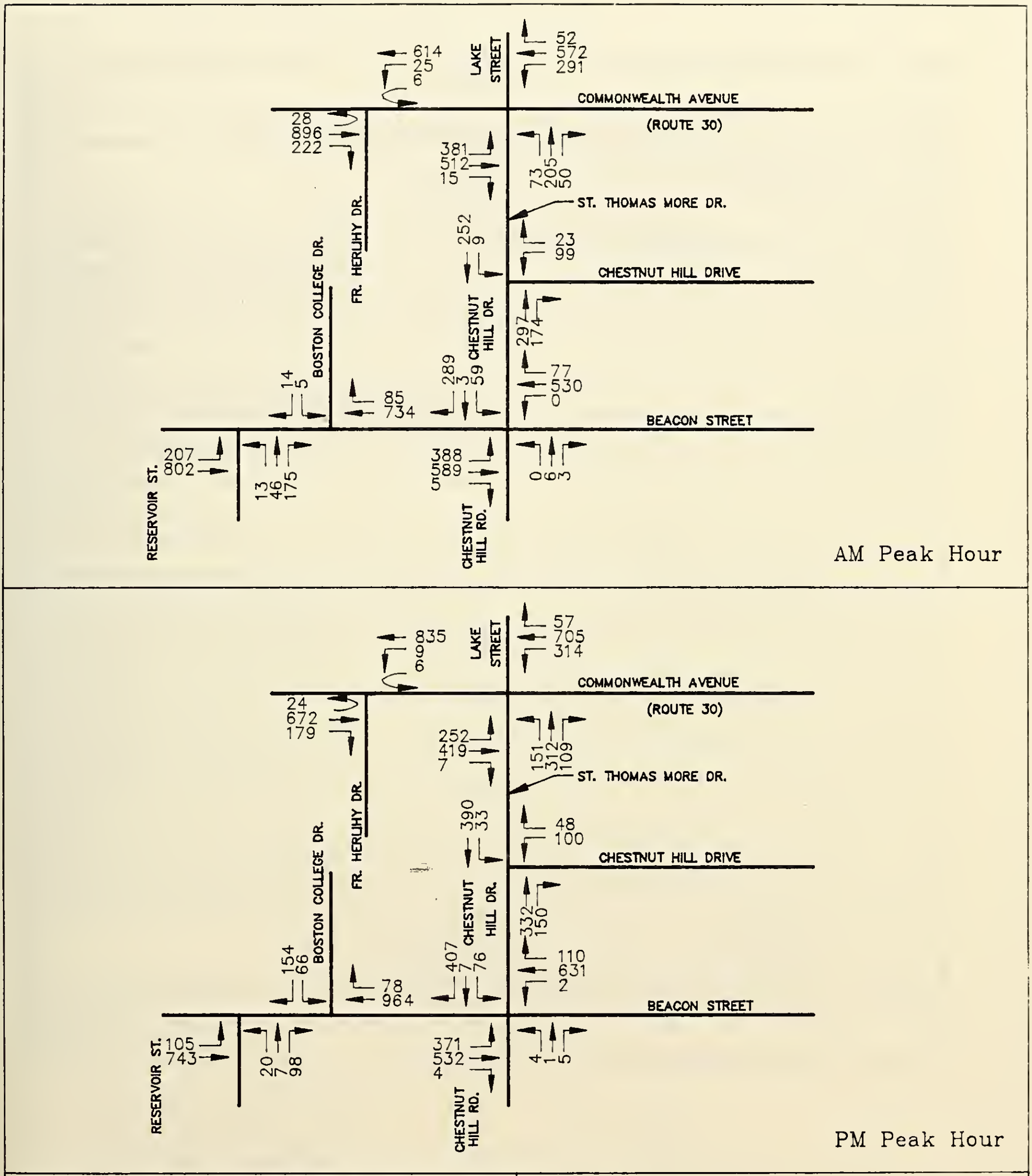
TABLE 13 MBTA BOSTON COLLEGE GREEN LINE - LAKE STREET STOP SUMMARY OF VOLUME TO CAPACITY RATIOS NO-BUILD CONDITION (1996)			
AM Peak Hour		PM Peak Hour	
Inbound Trolley	Outbound Trolley	Inbound Trolley	Outbound Trolley
0.13	0.08	0.07	0.07

Future Operating Conditions - Build Condition. The Build peak hour traffic volumes (shown on Figure 10) are the summation of the No-Build volumes and the project-generated volumes. In general, traffic volumes will be reduced for the morning peak hour upon completion of the proposed project. This is primarily due to the reduction in commuter students to the campus. For the afternoon peak hour, traffic is increased by approximately 4 percent along Beacon Street. This is attributed to trips generated by the function space within the new dining hall. As stated previously the College anticipates holding approximately 2 additional activities a week (when school is in session) at the function hall. Most of the events to be held in this function room are currently held in other spaces on campus. Therefore, this increase in traffic will occur only when *additional* activities are held.

Table 14 summarizes the results of the capacity analyses conducted for the study locations with the increase (and decrease) in traffic resulting from the proposed project. At the intersection of Beacon Street/Lake Street/St. Thomas More Drive operating conditions will remain at level of service "F". However, delays to motorists during peak commuting hours are slightly reduced due to traffic eliminated by the project. Overall, the levels of service at the unsignalized intersections for the Build conditions remain approximately the same as reported for the No-Build condition.

Public Transportation - Build Condition. The volume to capacity ratios for the Green Line trolley serving Boston College will not be measurably affected as a result of the project. The ratios are as reported for the No-Build condition.

The results of the capacity analyses performed for the existing, No-Build, and Build conditions are summarized in Table 15.



Boston College
Lower Campus Project

Not to Scale

Figure 10:

Peak Hour Traffic Volumes
Build Conditions (1996)

TABLE 14

LEVEL OF SERVICE SUMMARY - BUILD CONDITIONS (1996)

Unsignalized Intersection	AM Peak Hour			PM Peak Hour		
	Demand (p.c.p.h.)*	ARC** (p.c.p.h.)	LOS***	Demand	ARC	LOS
St. Thomas More Drive/Chestnut Hill Drive						
LT onto Chestnut Hill Drive	10	815	A	39	729	A
All movements from Chestnut Hill Drive	144	317	B	168	177	D
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road						
LT onto Chestnut Hill Drive	466	156	D	441	123	D
All movements from Chestnut Hill Road	9	26	E	10	-7	F
RT from Chestnut Hill Drive	328	397	B	514	150	D
Th/LT from Chestnut Hill Drive	70	-53	F	105	-89	F
Beacon Street/Reservoir Avenue/Boston College driveway						
LT onto Boston College Drive	304	199	D	131	265	C
LT from Reservoir Avenue	14	30	E	21	8	E
RT from Reservoir Avenue	234	78	E	104	294	C
LT from Boston College Drive	6	4	E	85	-63	F
Th/RT from Boston College Drive	18	424	A	199	138	D
Commonwealth Avenue/Fr. Herlihy Terrace						
LT onto Fr. Herlihy Terrace	38	225	C	17	397	B

Signalized Intersection	AM Peak Hour			PM Peak Hour		
	V/C+	Delay++	LOS	V/C	Delay	LOS
Commonwealth Ave./Lake St./St. Thomas More Drive	0.89	60.6	F	0.99	228.9	F

*	p.c.p.h. - passenger cars per hour
**	ARC - Available reserve capacity
***	LOS - Level of Service
+	V/C - volume to capacity ratio
++	Delay - average stopped delay per vehicle in seconds

TABLE 15

LEVEL OF SERVICE SUMMARY

	AM Peak Hour						PM Peak Hour					
	Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)		Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)	
Unsignalized Intersection	ARC* (p.c.p.h.)**	LOS***	ARC	LOS	ARC	LOS	ARC	LOS	ARC	LOS	ARC	LOS
St. Thomas More Drive/Chestnut Hill Drive												
LT onto Chestnut Hill Drive	745	A	805	A	815	A	818	A	792	A	729	A
All movements from Chestnut Hill Drive	305	B	312	B	317	B	282	C	226	C	177	D
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road												
LT onto Chestnut Hill Drive	228	C	149	D	156	D	237	C	190	D	95	E
All movements from Chestnut Hill Road	50	E	24	E	26	E	9	E	-1	F	-8	F
RT from Chestnut Hill Drive	446	A	391	B	397	B	295	C	209	C	150	D
Th/LT from Chestnut Hill Drive	-34	F	-52	F	-53	F	-66	F	-82	F	-94	F
Beacon Street/Reservoir Street/Boston College driveway												
LT onto Boston College Drive	299	C	197	D	199	D	350	B	299	C	265	C
LT from Reservoir Road	49	E	30	E	30	E	33	E	13	E	8	E
RT from Reservoir Road	130	D	79	E	78	E	377	B	339	B	294	C
LT from Boston College Drive	+15	E	4	E	4	E	-45	F	-62	F	-63	F
Th/RT from Boston College Drive	457	A	421	A	424	A	186	D	135	D	138	D
Commonwealth Avenue/Fr. Herlihy Terrace												
LT onto Fr. Herlihy Terrace	239	C	218	C	225	C	434	A	406	A	397	B
	AM Peak Hour						PM Peak Hour					
	Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)		Existing Condition (1992)		No-Build Condition (1996)		Build Condition (1996)	
Signalized Intersection	Delay+	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Commonwealth Ave./Lake St./St. Thomas More Dive	49.2	E	65.2	F	60.6	F	188.1	F	243.5	F	228.9	F

* ARC - available reserve capacity

** p.c.p.h. - passenger cars per hour

*** LOS - Level of Service

+ Delay - average stopped delay per vehicle in seconds

PARKING IMPACTS

The impacts to available parking of Lower Campus were evaluated for this Project and the proposed student center and parking garage project, as both will be complete by 1996. Presented in Table 16 are the total number of spaces eliminated and replaced for each project. In addition, a summary of the final volume of parking spaces in 1996 is shown. By 1996 there will be a net increase of 571 spaces on Lower Campus. The College intends to provide an additional 200 resident parking stickers to students living on campus. Thus, the actual increase in parking supply on Lower Campus, in 1996, is 371 spaces.

In 1993, as a result of the proposed dormitories and dining facility, 322 spaces are eliminated; however, the college will provide 365 replacement spaces for a net increase of 43 spaces. The location of the spaces eliminated and replaced are listed in Table 16.

Pedestrian Circulation

The proposed project attempts to impact the existing circulation patterns by more strongly defining desirable routes across the Lower Campus. The entry to the campus will be relandscaped to receive a gate or similar "arrival" structure. New sidewalks and paving will then direct pedestrians between Walsh Hall and Dormitory A or through a heavily planted parking court. Beyond the parking court, the wing of Dormitory A and a third dormitory building (to be construction after 1996) converge to imply another gateway designed to draw movement into the plaza in front of the dining facility. From this open space, pathways move between the dining facility and Dormitory A toward the future playing fields and across the Lower Campus Road to the smaller entry plaza of Dormitory B. An open stairway leads from here to the newly closed green courtyard formed by 66 Commonwealth Avenue and "B". At the western edge of Dormitory B, a ramp will lead pedestrians past a green knoll and up to the hillside dormitories.

This system of pathways and green spaces is intended to improve the nature of crossing the campus on foot and to separate pedestrians from vehicular traffic.

TABLE 16

BOSTON COLLEGE LOWER CAMPUS
PARKING SUMMARY

	Dormitory and Dining Facility Project 1993	Student Center and Parking Garage Project 1996	Total Lower Campus Parking 1996
Eliminated Parking			
Theater Lot	169	4	173
Lower Campus Road	58	90	148
Walsh Hall Lot	95		95
Buildings & Grounds Lot		31	31
Tennis Court Lot		114	114
Conte Forum Lot		33	33
Total Eliminated Spaces	322	272	594
Replacement Parking			
New Parking Garage		800	800
Elimination of 50 Parking Stickers	50		50
Hammond Pond Parkway Lot	200		200
1380 Soldiers Field Road Lot	50		50
General Restripping	50		50
St. Thomas More Hall Lot	15		15
Total Replacement Parking	365	800	1,165
Net Increase in Parking Spaces	43	528	571

RECOMMENDATIONS FOR INTERSECTION IMPROVEMENTS

Based on the results of the intersection capacity analyses performed for the existing conditions, improvements are currently needed at three locations in the study area. Operating conditions at the intersections of Commonwealth Avenue/Lake Street/ St. Thomas More Drive, Beacon Street/Chestnut Hill Drive/Chestnut Hill Road, and Beacon Street/Reservoir Avenue/Boston College Drive are currently poor during the peak commuting hours. With or without the proposed Boston College projects, improvements are needed to increase the capacity of these intersections and reduce delays to motorists.

Commonwealth Avenue/Lake Street/St. Thomas More Drive

The existing phasing and timing of the Commonwealth Avenue/Lake Street/St. Thomas More Drive intersection is not efficient. The phase that permits eastbound traffic to travel and the trolley to enter or exit the Lake Street station is recalled every cycle whether a train is or is not present at the intersection. This results in unnecessary downtime for the entire intersection. This phase should be activated only when a train is present. Furthermore, this intersection would operate at significantly increased capacity with a fully actuated signal controller that has the ability to select one of several phases based on traffic conditions.

Corresponding to the recommended signal improvements are several minor geometric improvements. Each approach to the intersection requires exclusive left and right turn lanes. To install these lanes, increased signing and new pavement markings are necessary on all approaches (excluding Lake Street). In addition, elimination of the on-street parking spaces on the westbound approach of Commonwealth Avenue and widening of the St. Thomas More Drive approach by approximately 8 feet are required.

Beacon Street/Chestnut Hill Drive/Chestnut Hill Road

At the Beacon Street/Chestnut Hill Drive/Chestnut Hill Road intersection police officer control during peak commuter periods is required to increase capacity. Restriping of the eastbound approach of Beacon Street is also required to provide an exclusive left turn lane. The restriping of the eastbound approach will require a slight shifting of the centerline (to the north) on the westbound approach of Beacon Street. Installation of an exclusive left turn lane on Beacon Street will not, however, increase capacity without police control.

Beacon Street/Reservoir Avenue/Boston College driveway

Improvements may not be necessary at the Beacon Street/Reservoir Avenue/ Boston College driveway intersection if police officer control during peak hours is provided at the Beacon Street/Chestnut Hill Drive/Chestnut Hill Road intersection.

The platoons in traffic on Beacon Street resulting from the signal at the Beacon Street/ Hammond Street intersection and an officer at Chestnut Hill Drive will improve the ability of motorists to exit onto Beacon Street from either side street. This intersection should be monitored for future capacity deficiencies.

Table 17 summarizes the improvements recommended for these intersections.

TABLE 17

SUMMARY OF RECOMMENDED INTERSECTION IMPROVEMENTS

Commonwealth Avenue/Lake Street/St. Thomas More Drive	
•	Revise signal timing and phasing.
•	Provide an exclusive right turn lane on westbound Commonwealth Avenue by eliminated MBTA on-street parking.
•	Restripe the eastbound approach of Commonwealth Avenue to provide an exclusive left turn lane.
•	Widen St. Thomas More Drive to provide three approach lanes to the intersection.
Beacon Street/Chestnut Hill Drive/Chestnut Hill Road	
•	Provide police control during peak commuting hours.
•	Restripe Beacon Street to provide an exclusive left turn lane for vehicles turning onto Chestnut Hill Drive.
Beacon Street/Reservoir Avenue/Boston College driveway	
•	Monitor for future capacity deficiencies.

Additional capacity analyses were performed for the Commonwealth Avenue/ Lake Street/St. Thomas More Drive and Beacon Street/Chestnut Hill Drive/ Chestnut Hill Road intersections with the recommended improvements. As seen in Table 18, these intersections will operate at acceptable levels of service for the existing, No-Build, and Build conditions with implementation of the recommended improvements.

TABLE 18

LEVEL OF SERVICE SUMMARY WITH RECOMMENDED IMPROVEMENTS

Signalized Intersection	AM Peak Hour									PM Peak								
	Existing Condition			No-Build Condition			Build Condition			Existing Condition			No-Build Condition			Build Condition		
	V/C*	Delay**	LOS***	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Commonwealth Avenue/Lake Street/ St. Thomas More Drive	0.83	28.2	D	0.94	36.2	D	0.94	35.9	D	0.75	30.0	D	0.80	31.5	D	0.83	33.4	D
Beacon Street/ Chestnut Hill Drive/ Chestnut Hill Road	0.66	8.5	B	0.71	10.2	B	0.69	9.5	B	0.78	10.8	B	0.85	12.9	B	0.88	10.0	C

* V/C - volume to capacity ratio

** Delay - average stopped delay per vehicle in seconds

*** LOS - Level of Service

CONSTRUCTION IMPACTS AND MITIGATION

Boston College has selected Perini Corporation to construct the new dormitories and the dining facility. Perini recently completed the science building on the Chestnut Hill campus and is familiar with the site, the surrounding neighborhoods, and local traffic patterns. Perini has prepared for Boston College a Construction Impacts - Mitigation report. This section summarizes the major features of the mitigation plan and offers additional information regarding construction phasing and traffic, and parking impacts.

The construction area is limited to property owned by Boston College. No construction will occur on Commonwealth Avenue, Beacon Street, or College Road. With the exception of minor site utility work at the intersection of St. Thomas More Drive and Lower Campus Road, all construction will occur on the Lower Campus of Boston College as shown on Figure 11. All construction-related storage areas will be included within this area.

CONSTRUCTION PHASING

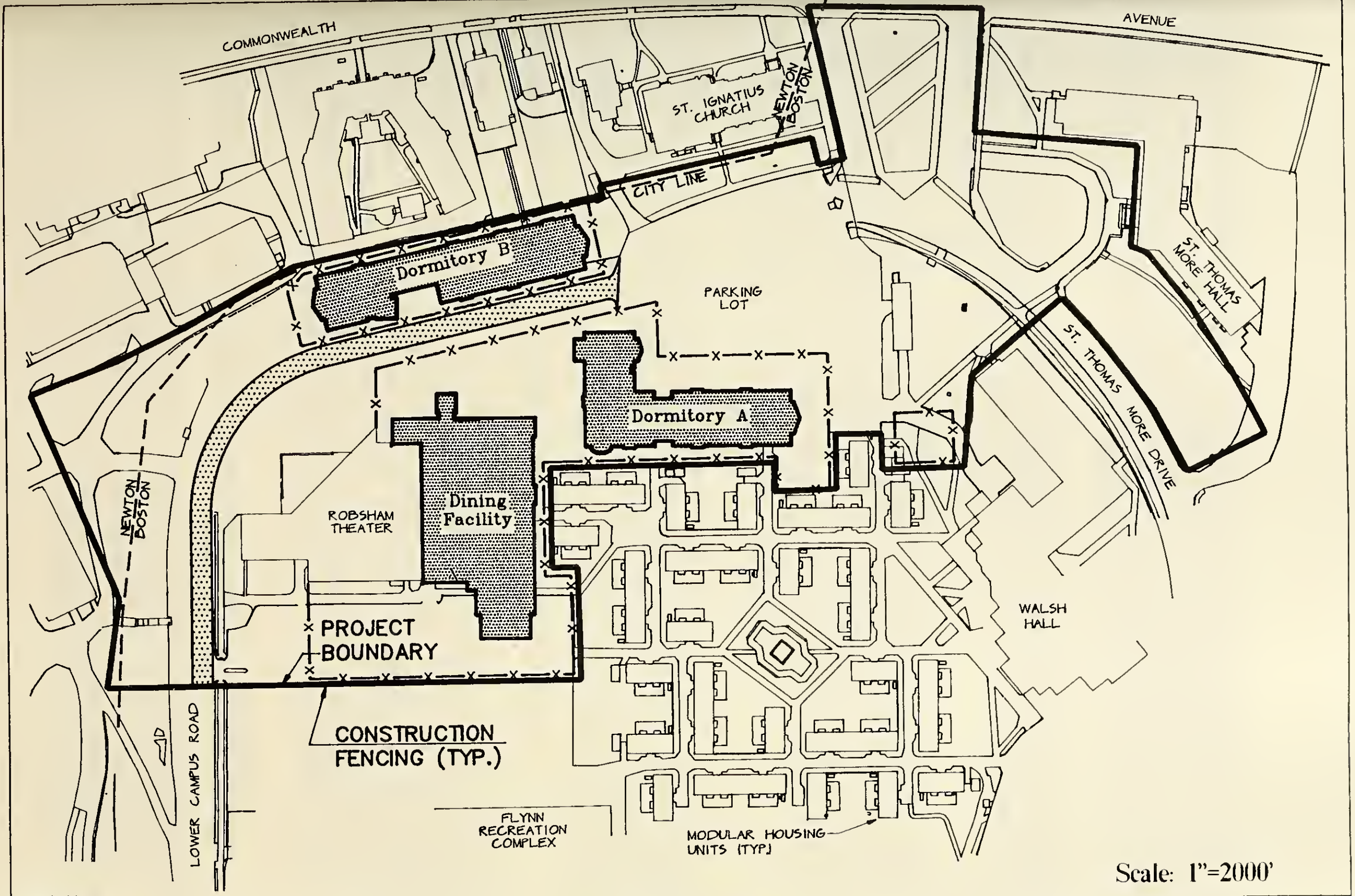
Construction of the two dormitories and the dining facility is anticipated to begin on May 4, 1992 and end on August 31, 1993. Site utility and earthwork should be complete by October 1992 and the buildings should be secure by March 1993.

CONSTRUCTION-RELATED TRAFFIC

Construction-related traffic generally includes two components: traffic generated by construction workers and traffic generated by vehicles hauling material in or out of the project site.

Construction Workers. The number of workers required will vary over the construction period. Generally 125 workers will be on site, but during the peak construction period occurring between January and April of 1993, it is estimated that 250 workers will be required.

Based on past experience, Perini estimates that 60 percent of construction workers will drive to work and 40 percent will use the "T". Currently, it is Perini's plan to schedule a 7:30 a.m. to 4:00 p.m. workday. The peak commuting hours along Commonwealth Avenue and Beacon Street occur from 8:00 a.m. and 9:00 a.m. and between 5:00 p.m. and 6:00 p.m. Therefore, traffic generated by construction personnel will not occur during the peak commuting hours. It is anticipated that generally the construction workers will generated approximately 300 new trips daily.



LIMITS OF CONSTRUCTION

BOSTON COLLEGE: LOWER CAMPUS PROJECT

Figure

11

Site Vehicles. Perini anticipates that approximately 25 trips will be made to and from the site each day by construction vehicles (deliveries and equipment). These trips will be evenly distributed throughout the work day. Thus, approximately 4 trips to and from the site will occur during the morning peak hour. Truck access to the site will be limited to the gate located on Lower Campus Road, adjacent to Saint Ignatius Church.

The total increase in vehicle trips to the site, due to construction-related activities, is anticipated at 350 daily trips with less than 10 trips occurring during the peak commuting hours. No significant impact to traffic conditions within the Chestnut Hill area will result from the construction of this project.

Traffic circulation on the Lower Campus of Boston College surrounding the project site will, however, be significantly impacted. Lower Campus Road in the vicinity of the project site will be closed during working hours. Access to and from Lower Campus will be via the gate located between the MDC park and Edmonds Hall. Although this temporary arrangement will be inconvenient for Boston College, it will have no impact to the nearby intersections of Commonwealth Avenue/Lake Street/St. Thomas More Drive and Beacon Street/Chestnut Hill Drive/Chestnut Hill Road.

During the evening and during special events at Boston College, Lower Campus Road will be limited to one-way traffic. It is recommended that traffic be directed southbound to accommodate entering traffic. Typically, entering traffic is more concentrated than exiting traffic. Thus, traffic would enter Lower Campus at the primary gate adjacent to St. Ignatius and depart at the gate located between the MDC park and Edmonds Hall.

PARKING ON LOWER CAMPUS DURING CONSTRUCTION

During construction approximately 322 parking spaces will be lost in the Theater lot, Walsh Hall lot and along Lower Campus Road. However, major mitigation measures, summarized in Table 19, are planned by Boston College to offset the loss of these parking spaces. A total of 495 new spaces will be made available during construction. Thus, a net increase of 173 spaces results. These spaces will be made available to the 125 workers constructing the project. During the peak construction period, it is estimated that of the 250 workers on site, 150 will drive to Lower Campus. The additional 173 spaces will be available for these workers.

CONSTRUCTION MITIGATION - NOISE, AIR, AND PEDESTRIAN

Construction mitigation procedures as described in the Perini report are summarized in Table 20. Particular sensitivity will be given to minimizing impacts to St. Ignatius Church. St. Ignatius Church is located at the corner of Lower Campus Road and Fr. Herlihy Terrace. Construction will be limited to weekdays to the extend possible; church parking will be preserved, and the church will be regularly informed of construction plans and their timing.

TABLE 19

PARKING MITIGATION MEASURES DURING CONSTRUCTION

Restriping of existing Lower Campus parking areas	50 spaces
Re-signing of St. Thomas More Drive to permit parking for construction workers	60 spaces
Widening of St. Thomas More Hall Circle	15 spaces
Reduction of parking permits	50 spaces
Modification of project's landscaping component	70 spaces
Off-campus parking lots with shuttle service to and from campus (Parking lots will be located on Hammond Pond Parkway and 1380 Soldier's Field Road)	250 spaces
Total Replacement Parking During Construction	495 spaces

TABLE 20

CONSTRUCTION MITIGATION MEASURES

Noise	Work will generally occur between 7:30 a.m. and 4:00 p.m. Overtime needs will first be met by extending the workday to 5:00 p.m. Trucks will not be permitted to idle longer than 15 minutes.
Traffic	Construction workers will regularly be encouraged to use public transportation to and from the site. Truck activity will be minimized during peak hour traffic hours (7:30 a.m. to 9:00 a.m. and 4:00 p.m. to 5:00 p.m.). In the immediate area, deliveries will be restricted to Beacon Street, Commonwealth Avenue, St. Thomas More Drive. Trucks will not be permitted on local residential streets. No double parking or traffic obstruction will be permitted by construction vehicles. Prior to construction of the project, a Construction Traffic and Staging Plan will be prepared. The plan will be a contractual obligation for all subcontractors and suppliers working on the project.
Dust	Dust-generating debris will be wetted. Storage of debris on-site will be minimized. Trucks hauling debris from the site will be covered. Dust-covered streets and sidewalks will be periodically cleaned.
Pedestrian Protection	A chain link fence will be placed around the perimeter of the project area. Walkways will be provided for pedestrians. Appropriate signage will be provided for pedestrian routing around the work area. Campus police will make security checks at least twice a night to ensure the site is secure.
Communications	There will be a designated representative for Boston College who will respond to any concerns regarding construction issues.

IMPLEMENTATION COMMITMENTS

Since the traffic analyses indicate that the Project itself has minimal traffic impacts and the problems described are unrelated to the Project, Boston College has made no specific commitments for transportation improvements. Boston College wishes to discuss a reasonable allocation of responsibility with the city of Boston and other appropriate parties.

With regard to the proposed construction-related parking and traffic impacts discussed, Boston College will implement the construction parking and traffic program identified in this access plan.

AUTOMATIC TRAFFIC RECORDER COUNTS

AUTOMATIC TRAFFIC RECORDER COUNT - - SUMMARY

FOR: RIZZO ASSOCIATES, INC.
BY: NORTHEAST TRAFFIC COUNTS
FILE: NEW-COM-RZ S-57 (15 cpi) L:90 #N-343.3

LOCATION: COMMONWEALTH AVENUE
WEST OF HERLIHY TERR

CITY/TOWN: NEWTON, MASSACHUSETTS

DATE: FEBRUARY - 1992

HOURLY TRAFFIC VOLUMES

	WESTBOUND TRAFFIC				EASTBOUND TRAFFIC				TOTAL TRAFFIC				
	TUE 2/18	WED 2/19	THU 2/20	FRI 2/21	TUE 2/18	WED 2/19	THU 2/20	FRI 2/21	TUE 2/18	WED 2/19	THU 2/20	FRI 2/21	
12- 1A	-	97	103	119	-	108	133	113	-	205	236	232	12-1 A
1- 2	-	58	75	81	-	64	88	103	-	122	163	184	1-2
2- 3	-	29	59	57	-	30	35	98	-	59	94	155	2-3
3- 4	-	11	26	28	-	16	27	29	-	27	53	57	3-4
4- 5	-	13	22	25	-	34	27	25	-	47	49	50	4-5
5- 6	-	42	37	47	-	59	85	95	-	101	122	142	5-6
6- 7	-	128	121	134	-	231	229	250	-	359	350	384	6-7
7- 8	-	272	332	346	-	618	559	485	-	890	891	831	7-8
8- 9	-	426	428	-	-	925	887	-	-	1351	1315	1359	8-9
9-10	-	367	331	-	-	594	556	-	-	961	887	914	9-10
10-11	-	319	295	-	-	492	514	-	-	811	809	823	10-11
11-12	-	347	340	-	-	517	569	-	-	864	909	891	11-12
12- 1P	-	394	408	-	-	554	584	-	-	948	992	940	12-1 P
1- 2	-	412	404	-	-	555	626	-	-	967	1030	-	1-2
2- 3	-	439	422	-	-	529	570	-	-	968	992	-	2-3
3- 4	526	460	529	-	591	585	580	-	1117	1045	1109	-	3-4
4- 5	600	426	591	-	560	854	620	-	1160	1280	1211	-	4-5
5- 6	671	661	689	-	712	699	717	-	1383	1360	1406	-	5-6
6- 7	581	619	612	-	708	696	666	-	1289	1315	1278	-	6-7
7- 8	407	364	449	-	467	463	533	-	874	827	982	-	7-8
8- 9	322	387	319	-	398	418	458	-	720	805	777	-	8-9
9-10	345	356	309	-	391	432	425	-	736	788	734	-	9-10
10-11	217	255	213	-	264	282	327	-	481	537	540	-	10-11
11-12	164	170	196	-	217	236	214	-	381	406	410	-	11-12
TOTAL	3833	7052	7310	837	4308	9991	10029	1198	8141	17043	17339	6962	TOTAL

```
AUTOMATIC TRAFFIC RECORDER COUNTS - SUMMARY BY 15 MINUTE PERIODS
----------------------------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.                           LOCATION:  COMMONWEALTH AVENUE
BY:   NORTHEAST TRAFFIC COUNTS                                    WEST OF HERLIHY TERR.
FILE: BC-C-T-15-RZ   T-58 (15cpi)  L:96  #N-343.3                 BOSTON COLLEGE
DATE: THURSDAY, FEBRUARY 20, 1992                                 NEWTON, MASSACHUSETTS
----------------------------------------------------------------------------------------------------------
TOTAL TRAFFIC VOLUMES    12-1   1-2   2-3   3-4   4-5   5-6   6-7   7-8   8-9  9-10 10-11 11-12
--------------------     ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
15 MIN ENDING  :15          57    55    25    21     7    17    49   149   325   243   229   202  AM PEAK HR= 13
15 MIN ENDING  :30          78    37    32     8     8    11    57   190   312   211   194   223      8:00-9:00
15 MIN ENDING  :45          53    30    20    13    21    33   110   255   335   207   201   229
15 MIN ENDING  :00          48    41    17    11    13    61   134   297   343   226   185   255   AM 12 HRS= 58
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   AM         236   163    94    53    49   122   350   891  1315   887   809   909
---------------------------------------------------------------------------------------------------
15 MIN ENDING  :15         252   259   240   281   303   349   324   255   214   191   153   132  PM PEAK HR= 14
15 MIN ENDING  :30         249   250   251   302   303   374   357   254   170   161   120   102      5:00-6:00
15 MIN ENDING  :45         263   259   228   265   296   345   285   237   182   223   131    87
15 MIN ENDING  :00         228   262   273   261   309   338   312   236   211   159   136    89   PM 12 HRS=114
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   PM         992  1030   992  1109  1211  1406  1278   982   777   734   540   410     24 HRS= 173
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
WESTBOUND VOLUMES        12-1   1-2   2-3   3-4   4-5   5-6   6-7   7-8   8-9  9-10 10-11 11-12
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
15 MIN ENDING  :15          17    29    12    10     2     6    15    53   115    92    74    80  AM PEAK HR=  4
15 MIN ENDING  :30          38    12    23     3     4     6    15    77    98    68    86    78      8:00-9:00
15 MIN ENDING  :45          28    15    11     6     8    11    36    99   101    78    75    90
15 MIN ENDING  :00          20    19    13     7     8    14    55   103   114    93    60    92   AM 12 HRS= 21
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   AM         103    75    59    26    22    37   121   332   428   331   295   340
---------------------------------------------------------------------------------------------------
15 MIN ENDING  :15         107   101    99   139   131   175   152   123    98    80    63    52  PM PEAK HR=  6
15 MIN ENDING  :30          99    92   106   134   147   189   178   119    69    71    46    50      4:45-5:45
15 MIN ENDING  :45         110   102    99   129   143   165   135    96    71   104    48    42
15 MIN ENDING  :00          92   109   118   127   170   160   147   111    81    54    56    52   PM 12 HRS= 51
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   PM         408   404   422   529   591   689   612   449   319   309   213   196     24 HRS=  73
----------------------------------------------------------------------------------------------------------

----------------------------------------------------------------------------------------------------------
EASTBOUND VOLUMES        12-1   1-2   2-3   3-4   4-5   5-6   6-7   7-8   8-9  9-10 10-11 11-12
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
15 MIN ENDING  :15          40    26    13    11     5    11    34    96   210   151   155   122  AM PEAK HR=  8
15 MIN ENDING  :30          40    25     9     5     4     5    42   113   214   143   108   145      8:00-9:00
15 MIN ENDING  :45          25    15     9     7    13    22    74   156   234   129   126   139
15 MIN ENDING  :00          28    22     4     4     5    47    79   194   229   133   125   163   AM 12 HRS= 37
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   AM         133    88    35    27    27    85   229   559   887   556   514   569
---------------------------------------------------------------------------------------------------
15 MIN ENDING  :15         145   158   141   142   172   174   172   132   116   111    90    80  PM PEAK HR=  7
15 MIN ENDING  :30         150   158   145   168   156   185   179   135   101    90    74    52      5:00-6:0
15 MIN ENDING  :45         153   157   129   136   153   180   150   141   111   119    83    45
15 MIN ENDING  :00         136   153   155   134   139   178   165   125   130   105    80    37   PM 12 HRS= 6
------------------       ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   PM         584   626   570   580   620   717   666   533   458   425   327   214     24 HRS= 10
----------------------------------------------------------------------------------------------------------
```

AUTOMATIC TRAFFIC RECORDER COUNT - - SUMMARY

FOR: RIZZO ASSOCIATES, INC.
BY: NORTHEAST TRAFFIC COUNTS
FILE: NEW-BEA-RZ S-57 (15 cpi) L:90 #N-343.3

LOCATION: BEACON STREET
WEST OF RESERVOIR AVENUE

CITY/TOWN: NEWTON, MASSACHUSETTS

DATE: FEBRUARY - 1992

HOURLY TRAFFIC VOLUMES

	EASTBOUND TRAFFIC				WESTBOUND TRAFFIC				TOTAL TRAFFIC				
	TUE 2/18	WED 2/19	THU 2/20	FRI 2/21	TUE 2/18	WED 2/19	THU 2/20	FRI 2/21	TUE 2/18	WED 2/19	THU 2/20	FRI 2/21	
12- 1A	-	45	54	67	-	93	128	138	-	138	182	205	12-1 A
1- 2	-	16	26	32	-	53	55	80	-	69	81	112	1-2
2- 3	-	13	9	19	-	23	37	84	-	36	46	103	2-3
3- 4	-	9	11	15	-	158	21	39	-	167	32	54	3-4
4- 5	-	16	18	25	-	12	13	11	-	28	31	36	4-5
5- 6	-	38	37	51	-	26	24	15	-	64	61	66	5-6
6- 7	-	198	213	192	-	105	108	91	-	303	321	283	6-7
7- 8	-	701	680	702	-	215	256	221	-	916	936	923	7-8
8- 9	-	1085	1032	1034	-	288	354	391	-	1373	1386	1425	8-9
9-10	-	702	652	706	-	303	339	418	-	1005	991	1124	9-10
10-11	-	555	653	607	-	358	385	427	-	913	1038	1034	10-11
11-12	-	524	658	571	-	432	454	488	-	956	1112	1059	11-12
12- 1P	-	617	556	621	-	486	513	615	-	1103	1069	1236	12-1 P
1- 2	-	635	578	-	-	463	547	-	-	1098	1125	-	1-2
2- 3	-	580	635	-	-	506	550	-	-	1086	1185	-	2-3
3- 4	599	587	663	-	621	620	662	-	1220	1207	1325	-	3-4
4- 5	575	687	657	-	743	708	760	-	1318	1395	1417	-	4-5
5- 6	710	738	683	-	788	748	830	-	1498	1486	1513	-	5-6
6- 7	666	681	680	-	686	665	768	-	1352	1346	1448	-	6-7
7- 8	358	432	488	-	557	507	544	-	915	939	1032	-	7-8
8- 9	303	349	336	-	379	460	441	-	682	809	777	-	8-9
9-10	334	354	367	-	472	444	410	-	806	798	777	-	9-10
10-11	218	222	202	-	251	287	308	-	469	509	510	-	10-11
11-12	154	147	148	-	144	178	175	-	298	325	323	-	11-12
TOTAL	3917	9931	10036	4642	4641	8138	8682	3018	8558	18069	18718	7660	TOTAL

```
AUTOMATIC TRAFFIC RECORDER COUNTS - SUMMARY BY 15 MINUTE PERIODS
-------------------------------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.                         LOCATION:   BEACON STREET
BY:   NORTHEAST TRAFFIC COUNTS                                   WEST OF RESERVOIR AVENUE
FILE: BC-B-T-15-RZ   T-58 (15cpi)  L:96  #N-343.3                BOSTON COLLEGE
DATE: THURSDAY, FEBRUARY 20, 1992                                NEWTON, MASSACHUSETTS
------------------------------------------------------------------------------------------------------------------------
TOTAL TRAFFIC VOLUMES      12-1   1-2   2-3   3-4   4-5   5-6   6-7   7-8   8-9  9-10 10-11 11-12
---------------------      ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
15 MIN ENDING  :15            51    32    17    11     3     8    40   133   299   262   271   254  AM PEAK HR= 1386
15 MIN ENDING  :30            47    10    10     9    13    10    61   213   335   240   283   285      8:00-9:00 AM
15 MIN ENDING  :45            49    25     6     6     8    15    95   260   375   232   248   263
15 MIN ENDING  :00            35    14    13     6     7    28   125   330   377   257   236   310   AM 12 HRS= 6217
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   AM           182    81    46    32    31    61   321   936  1386   991  1038  1112
-----------------------------------------------------------------------------------------------------------------
15 MIN ENDING  :15           280   273   303   307   337   373   404   296   219   189   147    91  PM PEAK HR= 1562
15 MIN ENDING  :30           257   297   245   317   358   371   389   267   179   182   154    80      5:30-6:30 PM
15 MIN ENDING  :45           256   283   309   341   334   397   329   226   180   227   118    94
15 MIN ENDING  :00           276   272   328   360   388   372   326   243   199   179    91    58   PM 12 HRS=12501
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   PM          1069  1125  1185  1325  1417  1513  1448  1032   777   777   510   323     24 HRS= 18718
------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------
EASTBOUND VOLUMES          12-1   1-2   2-3   3-4   4-5   5-6   6-7   7-8   8-9  9-10 10-11 11-12
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
15 MIN ENDING  :15            22    10     5     2     2     5    30    99   210   183   174   132  AM PEAK HR= 1032
15 MIN ENDING  :30            13     2     2     5     8     6    30   167   248   181   182   177      8:00-9:00 AM
15 MIN ENDING  :45             8     9     1     1     2    11    71   180   287   134   137   166
15 MIN ENDING  :00            11     5     1     3     6    15    82   234   287   154   160   183   AM 12 HRS= 4043
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   AM            54    26     9    11    18    37   213   680  1032   652   653   658
-----------------------------------------------------------------------------------------------------------------
15 MIN ENDING  :15           135   136   158   169   168   147   198   140    67    83    67    35  PM PEAK HR=  755
15 MIN ENDING  :30           143   154   171   142   184   167   188   130    82    90    68    37      5:30-6:30 PM
15 MIN ENDING  :45           131   143   156   179   151   185   149   107    98   102    44    46
15 MIN ENDING  :00           147   145   150   173   154   184   145   111    89    92    23    30   PM 12 HRS= 5993
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   PM           556   578   635   663   657   683   680   488   336   367   202   148     24 HRS= 10036
------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------
WESTBOUND VOLUMES          12-1   1-2   2-3   3-4   4-5   5-6   6-7   7-8   8-9  9-10 10-11 11-12
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
15 MIN ENDING  :15            29    22    12     9     1     3    10    34    89    79    97   122  AM PEAK HR=  454
15 MIN ENDING  :30            34     8     8     4     5     4    31    46    87    59   101   108      11:00-12:00 A
15 MIN ENDING  :45            41    16     5     5     6     4    24    80    88    98   111    97
15 MIN ENDING  :00            24     9    12     3     1    13    43    96    90   103    76   127   AM 12 HRS= 2174
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   AM           128    55    37    21    13    24   108   256   354   339   385   454
-----------------------------------------------------------------------------------------------------------------
15 MIN ENDING  :15           145   137   145   138   169   226   206   156   152   106    80    56  PM PEAK HR=  876
15 MIN ENDING  :30           114   143    74   175   174   204   201   137    97    92    86    43      4:45-5:45 PM
15 MIN ENDING  :45           125   140   153   162   183   212   180   119    82   125    74    48
15 MIN ENDING  :00           129   127   178   187   234   188   181   132   110    87    68    28   PM 12 HRS= 6508
------------------         ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
HOURLY TOTALS   PM           513   547   550   662   760   830   768   544   441   410   308   175     24 HRS=  8682
------------------------------------------------------------------------------------------------------------------------
```

MANUAL TURNING MOVEMENT COUNTS

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: NC-2RZ3A     Z-59(102)  (17csi)  L:96   #N-343.2  A1-BL99
------------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 3 - NEWTON, MASSACHUSETTS                                                 Date : THURSDAY
Major St. :  MORE DRIVE                                                                           FEBRUARY 13, 1992
Minor St. :  CHESTNUT HILL DRIVE                                  Sum Movements: ALL VEHICLES
------------------------------------------------------------------------------------------------------------------------
                   MORE DRIVE       CHESTNUT HILL DRIVE       MORE DRIVE
 TIME         .... FROM NORTH ....  .... FROM EAST ....  .... FROM SOUTH ....      TOTAL TRUCKS    VEHICLE
BEGIN              RT THRU   LT    PED   RT THRU   LT    PED   RT THRU   LT      ALL DIRECTIONS    TOTAL
------------------------------------------------------------------------------------------------------------------------
 7:45  AM           0   47    2      0    3    0   19      0   36   51    0          0    0    0      158

 8:00  AM           0   50    2      0    6    0   24      0   39   50    0          0    0    0      171
 8:15               0   36    3      0    2    0   15      0   35   54    0          0    0    0      145
 8:30               0   48    2      0    8    0   28      0   27   63    0          0    0    0      176
 8:45               0   45    0      0    9    0   18      0   29   58    0          0    0    0      159
------            ---- ---- ----   ---- ---- ---- ----   ---- ---- ---- ----       ---- ---- ----    -----
HR TOTAL            0  179    7      0   25    0   85      0  130  225    0          0    0    0      651

 9:00  AM           0   50    0      0    4    0   12      0   15   53    0          0    0    0      134
 9:15               0   45    0      0    5    0   10      0    9   49    0          0    0    0      118
 9:30               0   50    1      0    4    0   23      0   15   44    0          0    0    0      137
 9:45               0   33    0      0    2    0    6      0   11   28    0          0    0    0       80
------            ---- ---- ----   ---- ---- ---- ----   ---- ---- ---- ----       ---- ---- ----   ------
HR TOTAL            0  178    1      0   15    0   51      0   50  174    0          0    0    0      469

10:00  AM           0   54    2      0    2    0    8      0   12   43    0          0    0    0      121
10:15               0   36    2      0    6    0   15      0   12   29    0          0    0    0      100
10:30               0   33    0      0    5    0   15      0   16   36    0          0    0    0      105
10:45               0    0    0      0    0    0    0      0    0    0    0          0    0    0        0
------            ---- ---- ----   ---- ---- ---- ----   ---- ---- ---- ----       ---- ---- ----   ------
HR TOTAL            0  123    4      0   13    0   38      0   40  108    0          0    0    0      326



------------------------------------------------------------------------------------------------------------------------
DAY TOTAL           0  527   14      0   56    0  193      0  256  558    0          0    0    0     1604

                                         PEAK PERIOD ANALYSIS FOR THE PERIOD:    7:45 TO  10:45  AM

                  DIRECTION  START      PEAK HR    .........VOLUMES..........   .....PERCENTS.....
                    FROM    PEAK HR     FACTOR       --     RT THRU  LFT  TOT     --   RT THRU  LFT
                  -----------------------------------------------------------   ------------------
                  NORTH     8:45 AM     0.94                 0  190    1  191          0%  99%   1%
                   EAST     8:00 AM     0.76                25    0   85  110         23%   0%  77%
                  SOUTH     7:45 AM     0.99               137  218    0  355         39%  61%   0%
                   WEST        - AM       -                  0    0    0    0          0%   0%   0%

                                        0.92             ENTIRE INTERSECTION

                  NORTH     8:00 AM     0.89                 0  179    7  186          0%  96%   4%
                   EAST                 0.76                25    0   85  110         23%   0%  77%
                  SOUTH                 0.99               130  225    0  355         37%  63%   0%
                   WEST                   -                  0    0    0    0          0%   0%   0%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ3P     Z-59(102)  (17csi)  L:96   #N-343.2  A1-BL99
-----------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 3 - NEWTON, MASSACHUSETTS                                         Date : THURSDAY
Major St. :  MORE DRIVE                                                                   FEBRUARY 13, 1992
Minor St. :  CHESTNUT HILL DRIVE                            Sum Movements: ALL VEHICLES
-----------------------------------------------------------------------------------------------------------------
                  MORE DRIVE       CHESTNUT HILL DRIVE       MORE DRIVE
 TIME        .... FROM NORTH ....  .... FROM EAST ....  .... FROM SOUTH ....       TOTAL TRUCKS      VEHICLE
BEGIN              RT THRU   LT   PED   RT THRU   LT   PED   RT THRU   LT        ALL DIRECTIONS     TOTAL
-----------------------------------------------------------------------------------------------------------------
 3:45  PM           0   88    8     0    6    0   11     0   15   74    0           0    0    0       202

 4:00  PM           0   72    8     0    5    0   18     0   18   42    0           0    0    0       163
 4:15               0   93   14     0   10    0   23     0   20   45    0           0    0    0       205
 4:30               0   79   11     0    8    0   19     0   31   65    0           0    0    0       213
 4:45               0   81    6     0    8    0   21     0   28   42    0           0    0    0       186
------            ---- ---- ----  ---- ---- ---- ----  ---- ---- ---- ----        ---- ---- ----     -----
HR TOTAL            0  325   39     0   31    0   81     0   97  194    0           0    0    0       767

 5:00  PM           0   76    3     0    4    0   23     0   24   50    0           0    0    0       180
 5:15               0   71   14     0    8    0   20     0   23   45    0           0    0    0       181
 5:30               0   66    8     0    4    0   25     0   25   46    0           0    0    0       174
 5:45               0   64    9     0    2    0   28     0   12   50    0           0    0    0       165
------            ---- ---- ----  ---- ---- ---- ----  ---- ---- ---- ----        ---- ---- ----    ------
HR TOTAL            0  277   34     0   18    0   96     0   84  191    0           0    0    0       700

 6:00  PM           0   41    6     0    8    0   10     0   33   42    0           0    0    0       140
 6:15               0   63    6     0    4    0   14     0   20   58    0           0    0    0       165
 6:30               0   69   11     0    4    0   12     0   24   56    0           0    0    0       176
 6:45               0   35    5     0    3    0    9     0   19   43    0           0    0    0       114
------            ---- ---- ----  ---- ---- ---- ----  ---- ---- ---- ----        ---- ---- ----    ------
HR TOTAL            0  208   28     0   19    0   45     0   96  199    0           0    0    0       595

 7:00               0   59    4     0    3    0   28     0   24   49    0           0    0    0       167

-----------------------------------------------------------------------------------------------------------------
DAY TOTAL           0  957  113     0   77    0  261     0  316  707    0      0    0    0    0      2431

                                 PEAK PERIOD ANALYSIS FOR THE PERIOD:    3:45 TO  7:15  PM

                DIRECTION  START     PEAK HR   ..........VOLUMES...........   .....PERCENTS.....
                  FROM    PEAK HR    FACTOR     --     RT THRU  LFT   TOT     --   RT THRU  LFT
                ----------------------------------------------------------   ------------------
                NORTH      3:45 PM    0.87              0  332   41   373            0%  89%  11%
                 EAST      4:15 PM    0.88             30    0   86   116           26%   0%  74%
                SOUTH      3:45 PM    0.81             84  226    0   310           27%  73%   0%
                 WEST         - PM     -                0    0    0     0            0%   0%   0%

                                      0.92         ENTIRE INTERSECTION

                NORTH      4:15 PM    0.85              0  329   34   363            0%  91%   9%
                 EAST                 0.88             30    0   86   116           26%   0%  74%
                SOUTH                 0.79            103  202    0   305           34%  66%   0%
                 WEST                  -                0    0    0     0            0%   0%   0%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ4A      Z-59(108)  (17csi)  L:98   #N-343.2  A1-BL99
--------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 4 - NEWTON, MASSACHUSETTS                                       Date : THURSDAY
Major St. :  BEACON STREET                                                              FEBRUARY 13, 1992
Minor St. :  CHESTNUT HILL RD/DR.                             Sum Movements: ALL VEHICLES
-------------------------------------------------------------------------------------------------------
                CHESTNUT HILL DRIVE          BEACON STREET     CHESTNUT HILL ROAD        BEACON STREET
 TIME          .... FROM NORTH ....    .... FROM EAST ....    .... FROM SOUTH ....   .... FROM WEST ....   VEHICLE
BEGIN          PED   RT THRU   LT      PED   RT THRU   LT          RT THRU   LT          RT THRU   LT     TOTAL
--------------------------------------------------------------------------------------------------------
 7:45  AM        0   70    1   12        0   20  159    0           1    1    0           2  149   88      503

 8:00  AM        1   73    0   23        0   26  154    0           1    2    0           3  151   96      530
 8:15            1   66    0   13        0   14   86    0           1    1    0           0  130   80      392
 8:30            0   75    2    5        0   23   89    0           0    2    0           0  106  102      404
 8:45            1   80    2    6        0   26   65    0           0    0    0           3   98  103      384
------         ---- ---- ---- ----     ---- ---- ---- ----        ---- ---- ----        ---- ---- ----    -----
HR TOTAL         3  294    4   47        0   89  394    0           2    5    0           6  485  381     1710

 9:00  AM        0   57    1    6        0   12   66    0           3    0    0           1   95   66      307
 9:15            1   60    0    5        1   13   84    0           0    1    2           2  103   48      319
 9:30            2   58    0   16        0    8   55    1           2    2    1           0   57   45      247
 9:45            0   58    2    6        0    9   71    0           0    1    0           0   84   35      266
------         ---- ---- ---- ----     ---- ---- ---- ----        ---- ---- ----        ---- ---- ----   ------
HR TOTAL         3  233    3   33        1   42  276    1           5    4    3           3  339  194     1139

10:00  AM        1   60    2    9        1   16   50    0           0    0    0           1   56   44      239
10:15            0   77    2    9        0    8   72    0           1    2    1           0   75   57      304
10:30            0   49    1    9        0   14   86    1           1    0    0           1   88   45      295
10:45            1    0    0    0        0    0    0    0           0    0    0           0    0    0        1
------         ---- ---- ---- ----     ---- ---- ---- ----        ---- ---- ----        ---- ---- ----   ------
HR TOTAL         2  186    5   27        1   38  208    1           2    2    1           2  219  146      839



-------------------------------------------------------------------------------------------------------
DAY TOTAL        8  783   13  119        2  189 1037    2          10   12    4          13 1192  809     4191

                                    PEAK PERIOD ANALYSIS FOR THE PERIOD:    7:45 TO  10:45  AM

                  DIRECTION  START      PEAK HR    .........VOLUMES...........    .....PERCENTS.....
                    FROM    PEAK HR     FACTOR       --     RT THRU  LFT  TOT      --   RT THRU  LFT
                  --------------------------------------------------------------------------------
                  NORTH     8:00 AM     0.90               294    4   47  345          85%   1%  14%
                   EAST     7:45 AM     0.79                83  488    0  571          15%  85%   0%
                  SOUTH     9:00 AM     0.60                 5    4    3   12          42%  33%  25%
                   WEST     7:45 AM     0.91                 5  536  366  907           1%  59%  40%

                                        0.86          ENTIRE INTERSECTION

                  NORTH     7:45 AM     0.89               284    3   53  340          84%   1%  16%
                   EAST                 0.79                83  488    0  571          15%  85%   0%
                  SOUTH                 0.75                 3    6    0    9          33%  67%   0%
                   WEST                 0.91                 5  536  366  907           1%  59%  40%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ4A      Z-59(108)  (17csi)  L:98   #N-343.2
-------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 4 - NEWTON, MASSACHUSETTS                                              Date : THURSDAY
Major St. :  BEACON STREET                                                                     FEBRUARY 13, 1992
Minor St. :  CHESTNUT HILL RD/DR.                  Secondary Movement:   TRUCKS
-------------------------------------------------------------------------------------------------------------------
                CHESTNUT HILL DR.       BEACON STREET    CHESTNUT HILL ROAD          BEACON STREET
   TIME       .... FROM NORTH ....  .... FROM EAST ....   .... FROM SOUTH ....  .... FROM WEST ....   VEHICLE
BEGIN           --   RT THRU   LT     --   RT THRU   LT     --   RT THRU   LT     --   RT THRU   LT    TOTAL
-------------------------------------------------------------------------------------------------------------------
 7:45  AM             1    0    0           0    0    0           0    0    0           0    0    1        2

 8:00  AM             1    0    0           0    0    0           0    0    0           0    0    1        2
 8:15                 1    0    0           0    0    0           0    0    0           0    0    1        2
 8:30                 1    0    0           0    0    0           0    0    0           0    0    0        1
 8:45                 1    0    0           0    0    0           0    0    0           0    0    1        2
------             ---- ---- ----        ---- ---- ----        ---- ---- ----        ---- ---- ----   ------
HR TOTAL              4    0    0           0    0    0           0    0    0           0    0    3        7

 9:00  AM             2    0    0           0    0    0           0    0    0           0    0    0        2
 9:15                 1    0    0           0    0    0           0    0    0           0    0    0        1
 9:30                 1    0    0           0    0    0           0    0    0           0    0    1        2
 9:45                 2    0    0           0    0    0           0    0    0           0    0    0        2
------             ---- ---- ----        ---- ---- ----        ---- ---- ----        ---- ---- ----   ------
HR TOTAL              6    0    0           0    0    0           0    0    0           0    0    1        7

10:00  AM             1    0    0           0    0    0           0    0    0           0    0    0        1
10:15                 1    0    0           0    0    0           0    0    0           0    0    1        2
10:30                 1    0    0           0    0    0           0    0    0           0    0    0        1
10:45                 -    -    -           -    -    -           -    -    -           -    -    -        0
------             ---- ---- ----        ---- ---- ----        ---- ---- ----        ---- ---- ----   ------
HR TOTAL              3    0    0           0    0    0           0    0    0           0    0    1        4



-------------------------------------------------------------------------------------------------------------------


DAY TOTAL            14    0    0           0    0    0           0    0    0           0    0    6       20
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ4P     Z-59(108)  (17csi)  L:98   #N-343.2  A1-BL99
--------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 4 - NEWTON, MASSACHUSETTS                                   Date : THURSDAY
Major St. :  BEACON STREET                                                          FEBRUARY 13, 1992
Minor St. :  CHESTNUT HILL RD./DR.                    Sum Movements: ALL VEHICLES
--------------------------------------------------------------------------------------------------------
                CHESTNUT HILL DR.       BEACON STREET      CHESTNUT HILL ROAD      BEACON STREET
TIME           .... FROM NORTH ....   .... FROM EAST ....   .... FROM SOUTH ....   .... FROM WEST ....   VEHICLE
BEGIN          PED   RT THRU   LT     PED   RT THRU   LT         RT THRU   LT         RT THRU   LT     TOTAL
--------------------------------------------------------------------------------------------------------
 3:45  PM        0   80    0   18       0   26  138    0          0    0    0          0  115   70       447

 4:00  PM        1  113    0   19       0   10  124    0          1    0    2          1   90   75       436
 4:15            1   88    1   20       0   13  146    0          1    0    0          3   95   63       431
 4:30            0   89    0   20       0   14   81    1          0    2    1          1   83   83       375
 4:45            1   90    1   28       0   10  138    0          1    1    0          0   70   76       416
------         ---- ---- ---- ----   ---- ---- ---- ----       ---- ---- ----       ---- ---- ----     -----
HR TOTAL         3  380    2   87       0   47  489    1          3    3    3          5  338  297      1658

 5:00  PM        0  109    3   23       0   17  143    2          0    1    0          2  122   64       486
 5:15            1   74    1   18       1   21  152    0          1    0    0          4  128   62       462
 5:30            2  109    2   21       0   29  122    1          0    0    0          1   91   90       468
 5:45            0   83    1   10       0   15  147    0          3    0    1          1  117   42       420
------         ---- ---- ---- ----   ---- ---- ---- ----       ---- ---- ----       ---- ---- ----    ------
HR TOTAL         3  375    7   72       1   82  564    3          4    1    1          8  458  258      1836

 6:00  PM        1   62    1   31       1   19  148    0          2    1    1          1  125   80       472
 6:15            0   81    3   19       0   26  180    1          0    0    2          1  160   86       559
 6:30            0   66    1   18       0   25   53    0          0    0    0          2   50   66       281
 6:45            1   41    0   19       0   19  114    1          0    0    1          2   92   45       335
------         ---- ---- ---- ----   ---- ---- ---- ----       ---- ---- ----       ---- ---- ----    ------
HR TOTAL         2  250    5   87       1   89  495    2          2    1    4          6  427  277      1647

 7:00            1   68    1   21       0   16  133    0          0    0    0          0  102   69       411

-------------------------------------------------------------------------------------------------------
DAY TOTAL        9 1153   15  285       2  260 1819    6          9    5    8         19 1440  971      5999

                                        PEAK PERIOD ANALYSIS FOR THE PERIOD:    3:45 TO  7:15  PM

                      DIRECTION  START       PEAK HR   .........VOLUMES...........   .....PERCENTS.....
                        FROM     PEAK HR     FACTOR     --    RT THRU  LFT  TOT      --   RT THRU  LFT
                      ------------------------------------------------------------------------------
                      NORTH      4:45 PM     0.89            382    7   90  479          80%   1%  19%
                       EAST      5:30 PM     0.83             89  597    2  688          13%  87%   0%
                      SOUTH      5:30 PM     0.63              5    1    4   10          50%  10%  40%
                       WEST      5:30 PM     0.80              4  493  298  795           1%  62%  37%

                                             0.86           ENTIRE INTERSECTION

                      NORTH      5:30 PM     0.80            335    7   81  423          79%   2%  19%
                       EAST                  0.83             89  597    2  688          13%  87%   0%
                      SOUTH                  0.63              5    1    4   10          50%  10%  40%
                       WEST                  0.80              4  493  298  795           1%  62%  37%
```

MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY

FOR: RIZZO ASSOCIATES, INC.
BY: NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ4P Z-59(108) (17csi) L:98 #N-343.2

SITE CODE : LOCATION # 4 - NEWTON, MASSACHUSETTS
Major St. : BEACON STREET
Minor St. : CHESTNUT HILL RD./DR. Secondary Movement: TRUCKS

Date : THURSDAY
FEBRUARY 13, 1992

	CHESTNUT HILL DR.			BEACON STREET			CHESTNUT HILL ROAD			BEACON STREET			
TIME	.... FROM NORTH			.... FROM EAST			.... FROM SOUTH			.... FROM WEST			VEHICLE
BEGIN	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	TOTAL
3:45 PM	2	0	0	0	0	0	0	0	0	0	0	0	2
4:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
4:15	1	0	0	0	0	0	0	0	0	0	0	0	1
4:30	1	0	0	0	0	0	0	0	0	0	0	0	1
4:45	1	0	0	0	0	0	0	0	0	0	0	0	1
HR TOTAL	4	0	0	0	0	0	0	0	0	0	0	0	4
5:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
5:15	1	0	0	0	0	0	0	0	0	0	0	0	1
5:30	1	0	0	0	0	0	0	0	0	0	0	0	1
5:45	1	0	0	0	0	0	0	0	0	0	0	0	1
HR TOTAL	4	0	0	0	0	0	0	0	0	0	0	0	4
6:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
6:15	1	0	0	0	0	0	0	0	0	0	0	0	1
6:30	1	0	0	0	0	0	0	0	0	0	0	0	1
6:45	1	-	-	-	-	-	-	-	-	-	-	-	1
HR TOTAL	4	0	0	0	0	0	0	0	0	0	0	0	4
7:00	0	0	0	0	0	0	0	0	0	0	0	0	0
DAY TOTAL	14	0	0	0	0	0	0	0	0	0	0	0	14

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ5A     Z-59(108)  (17csi)  L:97   #N-343.2  A1-BL99
----------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 5 - NEWTON, MASSACHUSETTS                                        Date : THURSDAY
Major St. :  BEACON STREET                                                               FEBRUARY 13, 1992
Minor St. :  RESERVOIR AVENUE - GARAGE GATE                  Sum Movements: ALL VEHICLES
----------------------------------------------------------------------------------------------------------
                  GARAGE GATE          BEACON STREET        RESERVOIR AVENUE      BEACON STREET
 TIME         .... FROM NORTH ....  .... FROM EAST ....  .... FROM SOUTH ....  .... FROM WEST ....    VEHICLE
BEGIN               RT THRU   LT         RT THRU   LT         RT THRU   LT         RT THRU   LT     TOTAL
----------------------------------------------------------------------------------------------------------
 7:45  AM            4    0    2         29  199    0         51   13    3          0  183   50       534

 8:00  AM            3    0    1         26  201    0         56   11    4          0  191   51       544
 8:15                3    0    0         10  143    0         33    9    2          0  176   49       425
 8:30                3    0    2         25  139    0         28   11    3          0  178   47       436
 8:45                4    0    4         33  113    0         24   13    5          0  173   40       409
------            ---- ---- ----       ---- ---- ----       ---- ---- ----       ---- ---- ----     -----
HR TOTAL            13    0    7         94  596    0        141   44   14          0  718  187      1814

 9:00  AM            3    0    3         18  105    0         28    6    0          0  131   33       327
 9:15                4    0    3         19  124    0         21    9    1          0  126   34       341
 9:30                5    0    0         18   94    0         15    4    1          0   87   31       255
 9:45                3    0    4         11  118    0         11    2    1          0   99   29       278
------            ---- ---- ----       ---- ---- ----       ---- ---- ----       ---- ---- ----    ------
HR TOTAL            15    0   10         66  441    0         75   21    3          0  443  127      1201

10:00  AM            4    0    4         18   92    0         17    0    1          0   78   33       247
10:15               10    0   11         16  133    0         21    2    0          0  100   24       317
10:30                9    0    9          5  130    0         14    2    0          0  110   10       289
10:45                0    0    0          0    0    0          0    0    0          0    0    0         0
------            ---- ---- ----       ---- ---- ----       ---- ---- ----       ---- ---- ----    ------
HR TOTAL            23    0   24         39  355    0         52    4    1          0  288   67       853



----------------------------------------------------------------------------------------------------------
DAY TOTAL           55    0   43        228 1591    0        319   82   21          0 1632  431      4402

                                    PEAK PERIOD ANALYSIS FOR THE PERIOD:    7:45 TO  10:45  AM

                  DIRECTION  START      PEAK HR    .........VOLUMES..........    .....PERCENTS.....
                    FROM    PEAK HR     FACTOR      --     RT THRU  LFT   TOT     --    RT THRU  LFT
                  ----------------------------------------------------------    ------------------
                  NORTH      9:45 AM    0.64               26    0   28    54          48%   0%  52%
                   EAST      7:45 AM    0.85               90  682    0   772          12%  88%   0%
                  SOUTH      7:45 AM    0.79              168   44   12   224          75%  20%   5%
                   WEST      7:45 AM    0.96                0  728  197   925           0%  79%  21%

                                        0.89             ENTIRE INTERSECTION

                  NORTH      7:45 AM    0.75               13    0    5    18          72%   0%  28%
                   EAST                 0.85               90  682    0   772          12%  88%   0%
                  SOUTH                 0.79              168   44   12   224          75%  20%   5%
                   WEST                 0.96                0  728  197   925           0%  79%  21%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ5P      Z-59(108)  (17csi)  L:97   #N-343.2  A1-BL99
------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 5 - NEWTON, MASSACHUSETTS                                          Date : THURSDAY
Major St. :  BEACON STREET                                                                 FEBRUARY 13, 1992
Minor St. :  RESERVOIR AVENUE - GARAGE GATE                   Sum Movements: ALL VEHICLES
-----------------------------------------------------------------------------------------------------------------
                  GARAGE GATE           BEACON STREET         RESERVOIR AVENUE      BEACON STREET
 TIME          .... FROM NORTH ....  .... FROM EAST ....   .... FROM SOUTH ....  .... FROM WEST ....   VEHICLE
BEGIN               RT THRU   LT          RT THRU   LT          RT THRU   LT          RT THRU   LT     TOTAL
-----------------------------------------------------------------------------------  ----------------------------
 3:45  PM           31    0    9          14  205    0          27    2    3           0  149   27       467

 4:00  PM           35    0   15          15  222    0          20    3    3           0  130   26       469
 4:15               33    0   16          18  215    0          11    6    2           0  132   15       448
 4:30               42    0   10          13  158    0          32    2    5           0  123    8       393
 4:45               38    0   10           9  220    0          19    2    2           0  117   13       430
------            ---- ---- ----        ---- ---- ----        ---- ---- ----        ---- ---- ----     -----
HR TOTAL           148    0   51          55  815    0          82   13   12           0  502   62      1740

 5:00  PM           46    0   15           2  250    0          18    0    2           0  153    5       491
 5:15               25    0    8          11  215    0          20    2    4           0  162    8       455
 5:30               23    0   12          10  222    0          23    0    1           0  147    5       443
 5:45               23    0    3          10  220    0          19    0    2           0  136    9       422
------            ---- ---- ----        ---- ---- ----        ---- ---- ----        ---- ---- ----    ------
HR TOTAL           117    0   38          33  907    0          80    2    9           0  598   27      1811

 6:00  PM           29    0   16          12  198    0          24    2    6           0  166   35       488
 6:15               81    0   31          21  240    0          21    3    5           0  193   36       631
 6:30               28    0   11           2  117    0          13    0    5           0   93   19       288
 6:45               20    0    9           4  150    0          20    0    1           0  108    8       320
------            ---- ---- ----        ---- ---- ----        ---- ---- ----        ---- ---- ----    ------
HR TOTAL           158    0   67          39  705    0          78    5   17           0  560   98      1727

 7:00  PM           25    0   10           4  196    0          24    1    6           0  137    9       412

-----------------------------------------------------------------------------------------------------------------
DAY TOTAL          479    0  175         145 2828    0         291   23   47           0 1946  223      6157

                                        PEAK PERIOD ANALYSIS FOR THE PERIOD:    3:45 TO  7:15  PM

                  DIRECTION  START      PEAK HR   .........VOLUMES...........   .....PERCENTS.....
                    FROM     PEAK HR    FACTOR       --     RT THRU  LFT  TOT     --   RT THRU  LFT
                  ----------------------------------------------------------   ------------------
                  NORTH      6:00 PM    0.50               158    0   67  225         70%   0%  30%
                   EAST      5:00 PM    0.93                33  907    0  940          4%  96%   0%
                  SOUTH      3:45 PM    0.74                90   13   13  116         78%  11%  11%
                   WEST      5:30 PM    0.79                 0  642   85  727          0%  88%  12%

                                        0.79             ENTIRE INTERSECTION

                  NORTH      5:30 PM    0.49               156    0   62  218         72%   0%  28%
                   EAST                 0.89                53  880    0  933          6%  94%   0%
                  SOUTH                 0.83                87    5   14  106         82%   5%  13%
                   WEST                 0.79                 0  642   85  727          0%  88%  12%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------

FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: HC-2RZ1A     Z-59(108)  (17csi)  L:98   #N-343.2  A1-BL99
---------------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 1 - NEWTON, MASSACHUSETTS                                                   Date : THURSDAY
Major St. :  COMMONWEALTH AVENUE                                                                    FEBRUARY 13, 1992
Minor St. :  LAKE STREET                                            Sum Movements: ALL VEHICLES
---------------------------------------------------------------------------------------------------------------------------
                     LAKE ST.          COMMONWEALTH AVENUE     ST. THOMAS MORE      COMMONWEALTH AVENUE
 TIME           .... FROM NORTH ....  .... FROM EAST ....     .... FROM SOUTH ....   .... FROM WEST ....    VEHICLE
BEGIN                RT THRU   LT     PED   RT THRU   LT      PED   RT THRU   LT     PED   RT THRU   LT      TOTAL
---------------------------------------------------------------------------------------------------------------------------
 7:45  AM             0    0    0       4   10  167   58        1   14   60   19      13    6  152  114        600

 8:00  AM             0    0    0       6   14  138   53        2    5   44   18      33    6  109   83        470
 8:15                 0    0    0       9   13  101   65        4    8   39   13      36    1  108   95        443
 8:30                 0    0    0       9   13  144  117        5   10   33   15      33    0  123   74        529
 8:45                 0    0    0       3   19  147   99        2    6   44   25      58    0  129   77        546
------               ---- ---- ----  ---- ---- ---- ----     ---- ---- ---- ----    ---- ---- ---- ----     -----
HR TOTAL              0    0    0      27   59  530  334       13   29  160   71     160    7  469  329       1988

 9:00  AM             0    0    0       2    6  111   56        1    5   31   18      42    1   86   59        373
 9:15                 0    0    0       2   13  109   60        2   11   38   14      37    1   76   35        357
 9:30                 0    0    0       1   12  119   45        5    9   36   12      48    0   79   39        351
 9:45                 0    0    0       1   10   62   29        1    5   16   15      37    1   50   40        228
------               ---- ---- ----  ---- ---- ---- ----     ---- ---- ---- ----    ---- ---- ---- ----    ------
HR TOTAL              0    0    0       6   41  401  190        9   30  121   59     164    3  291  173       1309

10:00  AM             0    0    0       9   15   77   51        4   10   11   11      67    0   63   27        265
10:15                 0    0    0       2    5   87   65        0   10    9    8      17    0   63   14        261
10:30                 0    0    0       2   10   94   40        1   15   17   16      19    1   73   26        292
10:45                 0    0    0       0    0    0    0        0    0    0    0       0    0    0    0          0
------               ---- ---- ----  ---- ---- ---- ----     ---- ---- ---- ----    ---- ---- ---- ----    ------
HR TOTAL              0    0    0      13   30  258  156        5   35   37   35     103    1  199   67        818



--------------------------------------------------------------------------------------------------------------------------

DAY TOTAL             0    0    0      50  140 1356  738       28  108  378  184     440   17 1111  683       4715

                                       PEAK PERIOD ANALYSIS FOR THE PERIOD:     7:45 TO  10:45  AM

                     DIRECTION  START     PEAK HR   .........VOLUMES...........    .....PERCENTS.....
                       FROM    PEAK HR    FACTOR       --    RT THRU  LFT  TOT       --   RT THRU  LFT
                     ----------------------------------------------------------    ------------------
                     NORTH       - AM       -                0    0    0    0              0%   0%   0%
                      EAST    8:00 AM     0.84              59  530  334  923              6%  57%  36%
                     SOUTH    7:45 AM     0.75              37  176   65  278             13%  63%  23%
                      WEST    7:45 AM     0.80              13  492  366  871              1%  56%  42%

                                          0.85          ENTIRE INTERSECTION

                     NORTH    7:45 AM       -                0    0    0    0              0%   0%   0%
                      EAST                0.81              50  550  293  893              6%  62%  33%
                     SOUTH                0.75              37  176   65  278             13%  63%  23%
                      WEST                0.67              13  492  366  871              1%  56%  42%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ1A     Z-59(108)  (17csi)  L:98  #N-343.2
-------------------------------------------------------------------------------------------------------------------
SITE CODE : LOCATION # 1 - NEWTON, MASSACHUSETTS                                              Date : THURSDAY
Major St. : COMMONWEALTH AVENUE                                                               FEBRUARY 13, 1992
Minor St. : LAKE STREET                           Secondary Movement:   TRUCKS
-------------------------------------------------------------------------------------------------------------------
                  LAKE ST.         COMMONWEALTH AVENUE        ST THOMAS MORE  COMMONWEALTH AVENUE
   TIME      .... FROM NORTH ....  .... FROM EAST ....    .... FROM SOUTH ....  .... FROM WEST ....   VEHICLE
BEGIN          --   RT THRU   LT     --    RT THRU   LT    --    RT THRU   LT    --    RT THRU   LT    TOTAL
-------------------------------------------------------------------------------------------------------------------
 7:45  AM            0    0    0            1   15    2           1    0    0           0    4    0

 8:00  AM            0    0    0            1   10    1           1    0    0           0    3    0       16
 8:15                0    0    0            1    3    0           3    0    2           0    5    0       14
 8:30                0    0    0            0    5    2           2    0    0           0    6    1       16
 8:45                0    0    0            1    6    1           2    4    4           0    5    0       23
------            ---- ---- ----        ---- ---- ----        ---- ---- ----         ---- ---- ----   ------
HR TOTAL             0    0    0            3   24    4           8    4    6           0   19    1       69

 9:00  AM            0    0    0            1    6    2           1    1    0           0    3    0       14
 9:15                0    0    0            1   10    3           3    0    0           0    3    0       20
 9:30                0    0    0            1    5    1           2    1    0           0    3    2       15
 9:45                0    0    0            3    6    2           1    3    0           0    5    2       22
------            ---- ---- ----        ---- ---- ----        ---- ---- ----         ---- ---- ----   ------
HR TOTAL             0    0    0            6   27    8           7    5    0           0   14    4       71

10:00  AM            0    0    0            1    5    0           1    0    0           0    3    1       11
10:15                0    0    0            0    5    1           2    1    0           0    3    1       13
10:30                0    0    0            1    4    0           3    1    0           0    3    1       13
10:45                -    -    -            -    -    -           -    -    -           -    -    -        0
------            ---- ---- ----        ---- ---- ----        ---- ---- ----         ---- ---- ----   ------
HR TOTAL             0    0    0            2   14    1           6    2    0           0    9    3       37



-------------------------------------------------------------------------------------------------------------------


DAY TOTAL            0    0    0           12   80   15          22   11    6           0   46    8      177
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ1P     Z-59(108)  (17csi)  L:98  #N-343.2  A1-BL99
---------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 1 - NEWTON, MASSACHUSETTS                                        Date : THURSDAY
Major St. :  COMMONWEALTH AVENUE                                                          FEBRUARY 13, 1992
Minor St. :  LAKE STREET                                       Sum Movements: ALL VEHICLES
---------------------------------------------------------------------------------------------------------------------
                        LAKE ST.         COMMONWEALTH AVENUE      ST THOMAS MORE DR.  COMMONWEALTH AVENUE
TIME                .... FROM NORTH ....   .... FROM EAST ....    .... FROM SOUTH ....    .... FROM WEST ....    VEHICLE
BEGIN                    RT THRU   LT     PED   RT THRU   LT     PED   RT THRU   LT     PED   RT THRU   LT      TOTAL
---------------------------------------------------------------------------------------------------------------------
 3:45  PM                 0    0    0       6   13  154   62       8   19   66   20      72    0   86   62        482

 4:00  PM                 0    0    0       4   14  182   65       4   17   54   27      72    2   81   50        492
 4:15                     0    0    0       0   27  166   69       0   31   53   39      71    1   86   43        515
 4:30                     0    0    0       3   15  171   66       4   40   93   46      77    1  118   65        615
 4:45                     0    0    0       2   13  145   56       3   19   73   30      25    2  106   62        506
------                 ---- ---- ----    ---- ---- ---- ----    ---- ---- ---- ----    ---- ---- ---- ----     ------
HR TOTAL                  0    0    0       9   69  664  256      11  107  273  142     245    6  391  220       2128

 5:00  PM                 0    0    0       3    6  163   76       0   27   71   39      25    1   78   71        532
 5:15                     0    0    0       0   21  198   50       0   21   62   34      31    1  101   44        532
 5:30                     0    0    0       2    5  173   61       2   18   71   38      44    0   95   69        530
 5:45                     0    0    0       2   17  165   54       4   20   47   27      48    0  102   59        491
------                 ---- ---- ----    ---- ---- ---- ----    ---- ---- ---- ----    ---- ---- ---- ----     ------
HR TOTAL                  0    0    0       7   49  699  241       6   86  251  138     148    2  376  243       2085

 6:00  PM                 0    0    0       2    4   98   28       3   13   54   33      18    0  103   47        380
 6:15                     0    0    0       1   10  123   33       2   16   58   45      24    2   92   65        444
 6:30                     0    0    0       1   11  108   28       1   16   54   38      20    1   71   53        380
 6:45                     0    0    0       0   26  129   42       1   11   58   23      26    1   98   68        456
------                 ---- ---- ----    ---- ---- ---- ----    ---- ---- ---- ----    ---- ---- ---- ----     ------
HR TOTAL                  0    0    0       4   51  458  131       7   56  224  139      88    4  364  233       1660

 7:00                     0    0    0       1    9  137   56       2   17   61   47       8    1   55   48        431

---------------------------------------------------------------------------------------------------------------------
DAY TOTAL                 0    0    0      27  191 2112  746      34  285  875  486     561   13 1272  806       6786

                                         PEAK PERIOD ANALYSIS FOR THE PERIOD:    3:45 TO  7:15  PM

                      DIRECTION  START     PEAK HR    .........VOLUMES...........    .....PERCENTS.....
                        FROM    PEAK HR    FACTOR      --    RT THRU  LFT  TOT       --   RT THRU  LFT
                      -----------------------------------------------------------    -------------------
                      NORTH       -  PM      -                0    0    0    0            0%   0%   0%
                       EAST     3:45 PM    0.96              69  673  262 1004            7%  67%  26%
                      SOUTH     4:15 PM    0.78             117  290  154  561           21%  52%  27%
                       WEST     4:30 PM    0.88               5  403  242  650            1%  62%  37%

                                           0.89          ENTIRE INTERSECTION

                      NORTH     4:30 PM      -                0    0    0    0            0%   0%   0%
                       EAST                0.91              55  677  248  980            6%  69%  25%
                      SOUTH                0.78             107  299  149  555           19%  54%  27%
                       WEST                0.88               5  403  242  650            1%  62%  37%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2RZ1P      Z-59(108)  (17csi)  L:98   #N-343.2
-------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 1 - NEWTON, MASSACHUSETTS                                   Date : THURSDAY
Major St. :  COMMONWEALTH AVENUE                                                    FEBRUARY 13, 1992
Minor St. :  LAKE STREET                         Secondary Movement:   TRUCKS
-------------------------------------------------------------------------------------------------------
                LAKE ST.         COMMONWEALTH AVENUE      ST THOMAS MORE   COMMONWEALTH AVENUE
  TIME       .... FROM NORTH ....  .... FROM EAST ....    .... FROM SOUTH ....  .... FROM WEST ....   VEHICLE
BEGIN           --  RT THRU  LT      --  RT THRU  LT      --  RT THRU  LT      --  RT THRU  LT      TOTAL
-------------------------------------------------------------------------------------------------------
 3:45  PM            0    0    0          0    2    0          1    0    0          0    2    1

 4:00  PM            0    0    0          0    5    1          3    2    0          0    2    2        15
 4:15                0    0    0          2    4    1          1    0    0          0    0    1         9
 4:30                0    0    0          0    3    0          2    0    0          0    0    0         5
 4:45                0    0    0          0    2    0          2    1    0          0    2    1         8
------            ---- ---- ----      ---- ---- ----      ---- ---- ----      ---- ---- ----    ------
HR TOTAL             0    0    0          2   14    2          8    3    0          0    4    4        37

 5:00  PM            0    0    0          1    1    1          1    1    0          0    0    1         6
 5:15                0    0    0          2    3    0          3    2    0          0    0    0        10
 5:30                0    0    0          1    4    1          2    1    0          0    0    0         9
 5:45                0    0    0          0    0    0          2    0    0          0    0    1         3
------            ---- ---- ----      ---- ---- ----      ---- ---- ----      ---- ---- ----    ------
HR TOTAL             0    0    0          4    8    2          8    4    0          0    0    2        28

 6:00  PM            0    0    0          0    1    0          1    0    0          0    0    0         2
 6:15                0    0    0          1    2    0          1    0    0          0    0    1         5
 6:30                0    0    0          1    1    1          1    0    0          0    0    1         5
 6:45                0    0    0          0    2    0          2    0    0          0    0    0         4
------            ---- ---- ----      ---- ---- ----      ---- ---- ----      ---- ---- ----    ------
HR TOTAL             0    0    0          2    6    1          5    0    0          0    0    2        16

 7:00  PM            0    0    0          0    1    0          1    0    0          0    0    0         2

-------------------------------------------------------------------------------------------------------

DAY TOTAL            0    0    0          8   30    5         22    7    0          0    6    9        81
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-3-RZ-11-A     Z-59  (17csi)  L:99   #N-343.3      A1-BL99
---------------------------------------------------------------------------------------------------------------
SITE CODE :      LOCATION # 11 - BOSTON COLLEGE, NEWTON, MASSACHUSETTS                          Date :   MONDAY
Major St. :      COMMONWEALTH AVENUE                                                            FEBRUARY 24, 1992
Minor St. :      FR. HERLIHY TERR.                             Sum Movements: ALL VEHICLES
---------------------------------------------------------------------------------------------------------------

                 PED PUSH BUTTON        COMMONWEALTH AVE.    FR. HERLIHY DRIVE      COMMONWEALTH AVE.
 TIME            PUSH    PUSH   NO     .... FROM EAST ....      .... FROM SOUTH .... .... FROM WEST ....      VEHICLE
BEGIN            WAIT  NO WAIT BUTTON       RT THRU   LT  U        RT THRU   LT          RT THRU   LT  U      TOTAL
---------------------------------------  -----------------------------------------  ------------------------------
 7:30   AM         0       0     3       0     0     2  1       0     0     0        48     0     0   4       58
 7:45              0       0     4       0     0     0  1       1     0     1        49     0     0   5       61
 8:00              0       3     3       0     0     2  2       0     0     0        35     0     0   6       51
 8:15              1       0     4       0     0     5  1       1     0     0        49     0     0   3       63
 8:30              1       0     5       0     0     8  0       0     0     0        65     0     0   5       83
 8:45              5       1    10       0     0     9  3       4     0     2        80     0     0  13      122
-----------       ---     ---  ---      ---   ---   --- --     ---   ---   ---       ---   ---   --- --     -----
                   7       4    29       0     0    26  8       6     0     3       326     0     0  36      438

 4:15   PM         0       1    12       0     0     4  1       0     0     3        34     0     0  10       65
 4:30              2       0     7       0     0    13  4       2     0     1        26     0     0   5       58
 4:45              3       0     5       0     0     0  0       0     0     0        35     0     0   6       46
 5:00              1       0     4       0     0     0  0       0     0     0        31     0     0  15       50
 5:15              2       1     7       0     0     2  8       0     0     0        28     0     0   2       48
 5:30              2       0     9       0     0    12  6       0     0     0        40     0     0   0       67
-----------       ---     ---  ---      ---   ---   --- --     ---   ---   ---       ---   ---   --- --     -----
                  10       2    44       0     0    31 19       2     0     4       194     0     0  38      334

---------------------------------------------------------------------------------------------------------------
```

STREET CAR OPERATIONS SUMMARY

FOR: RIZZO ASSOCIATES, INC.
BY: NORTHEAST TRAFFIC COUNTS
FILE: BC-SC-RZ-3 AD-59 (17csi) L:92 #N-343

SITE CODE: LOCATION # SC - BOSTON COLLEGE, NEWTON, MASSACHUSETTS
Major St.: COMMONWEALTH AVENUE
Minor St.: LAKE STREET

DATE: MONDAY
FEBRUARY 24, 1992

TIME	DIRECTION		CROSSING TIME (SEC.)	AUTO DELAYS (SEC.)
	OUTBOUND TO B.C.	INBOUND TO BOSTON		
7:28 AM	2		20	0
7:31	0	2	16	0
7:37	0	2	13	0
7:38	2	0	19	0
7:42	0	2	12	0
7:45	0	2	20	0
7:47	2	0	20	0
7:48	2	0	22	0
7:50	2	0	23	0
7:50	0	2	13	0
7:54	0	2	13	0
7:56	2	0	28	2
7:58	2	0	22	0
7:59	0	2	16	0
8:03	0	2	16	0
8:07	0	2	15	0
8:09	1	0	18	0
8:09	1	0	18	0
8:10	0	2	14	0
8:13	2	0	23	0
8:15	0	2	13	0
8:18 AM	2	0	21	4
8:20	2	0	20	0
8:20	0	2	13	0
8:25	0	2	13	0
8:29	2	0	19	0
8:30	0	2	13	0
8:31	2	0	20	0
8:35	0	2	13	0
8:41	0	2	15	0
8:45	0	2	18	0
8:49	2	0	23	0
8:50	0	2	16	0
8:52	2	0	25	0
8:54	2	0	25	0
8:55	0	2	17	0
8:58	2	0	24	0
9:00	0	2	18	0

TIME	DIRECTION		CROSSING TIME (SEC.)	AUTO DELAY (SEC.
	OUTBOUND TO B.C.	INBOUND TO BOSTON		
4:16 PM	0	2	14	0
4:19	0	2	28	7
4:22	2	0	27	1
4:26	0	2	16	0
4:29	0	2	14	0
4:31	2	0	19	0
4:33	2	0	24	0
4:35	0	2	25	0
4:36	0	2	16	0
4:39	0	2	30	9
4:42	0	2	16	0
4:47	0	2	17	0
4:49	2	0	22	0
4:52	2	0	18	0
4:53	0	2	25	0
4:55	0	2	27	0
5:00	0	2	17	0
5:04	0	2	19	0
5:04	2	0	21	0
5:05	2	0	21	0
5:07	0	2	19	0
5:11	0	2	11	0
5:14	0	2	16	0
5:14	2	0	24	0
5:19	0	2	18	0
5:24	0	2	10	0
5:26	2	0	22	0
5:30	0	2	16	0
5:31	2	0	27	1
5:32	2	0	24	0
5:34	0	2	21	0
5:34	2	0	23	0
5:39	0	2	16	0
5:44	2	0	28	3

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2R12A      Z-59(108)  (17csi)  L:97   #N-343.2  A1-BL99
------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 12 - NEWTON, MASSACHUSETTS           Sum Movements: ALL VEHICLES      Date : THURSDAY
Major St. :  MORE DRIVE                                                                       FEBRUARY 13, 1992
Minor St. :  GATE SOUTH OF EDMOND HALL - DRIVE SOUTH OF WALSH HALL
-----------------------------------------------------------------------------------------------------------------

                   MORE DRIVE       GATE S. OF EDMONDS      MORE DRIVE        DWY. S. OF WALSH HALL
 TIME          .... FROM NORTH ....  .... FROM WEST ....  .... FROM SOUTH ....  .... FROM WEST ....    VEHICLE
BEGIN      PED RT-W RT-E THRU   LT        RT THRU   LT    PED   RT THRU LT-E LT-W    RT THRU   LT     TOTAL
----------------------------------------------------------------------------------  ----------------------------

 7:45  AM  0   11   18   48    0        11    0   10      0    0   38   17  8       1    0   10       172

 8:00  AM  0   15   16   48    0        18    0   12      0    0   38   19  9       1    0   11       187
 8:15      4    3   24   39    0         0    0    5      2    0   23   33  8       4    0    6       145
 8:30      0    0   31   38    0        13    0    8      1    0   34   36  4       0    0    1       165
 8:45      1    2   44   36    0         2    0   12      0    0   23   44  2       9    0   13       187
------    --- ---- ---- ---- ----      ---- ---- ----   ---- ---- ---- ---- ----   ---- ---- ----     -----
HR TOT     5   20  115  161    0        33    0   37      3    0  118  132 23      14    0   31       684

 9:00      0    1   11   48    0         2    0    2      0    0   29   28  2       1    0    1       125
 9:15      0   10   17   50    0         4    0    4      0    0   20   34  4       0    0    5       148
 9:30      0    3   12   47    0         5    0    5      1    0   34   14  0       2    0    5       127
 9:45      0    4    6   33    0         4    0    2      0    0   12   18  0       0    0    0        79
------    --- ---- ---- ---- ----      ---- ---- ----   ---- ---- ---- ---- ----   ---- ---- ----    ------
HR TOT     0   18   46  178    0        15    0   13      1    0   95   94  6       3    0   11       479

10:00      0    5   12   49    0         9    0    1      0    0   20   25  2       3    0    0       126
10:15      0    5   16   32    0        12    0    1      0    0    5   30  3       0    0    1       105
10:30      0    1   13   21    0         8    0   15      0    0   18   24  5       5    0    0       110
10:45      0    0    0    0    0         0    0    0      0    0    0    0  0       0    0    0         0
------    --- ---- ---- ---- ----      ---- ---- ----   ---- ---- ---- ---- ----   ---- ---- ----    ------
HR TOT     0   11   41  102    0        29    0   17      0    0   43   79 10       8    0    1       341



-----------------------------------------------------------------------------------------------------------------
DAY TO     5   60  220  489    0        88    0   77      4    0  294  322 47      26    0   53      1676

                                        PEAK PERIOD ANALYSIS FOR THE PERIOD:     7:45 TO  10:45  AM

                      DIRECTION  START     PEAK HR   .........VOLUMES...........   .....PERCENTS.....
                        FROM    PEAK HR    FACTOR      --     RT THRU  LFT  TOT      --   RT THRU  LFT
                      -----------------------------------------------------------  -------------------
                      NORTH     8:00 AM  0 0.86             115  161    0  276          42%  58%   0%
                       EAST     7:45 AM  0 0.64              42    0   35   77          55%   0%  45%
                      SOUTH     8:00 AM  0 0.84               0  118  132  250           0%  47%  53%
                       WEST     8:00 AM  0 0.51              14    0   31   45          31%   0%  69%

                                           0.86           ENTIRE INTERSECTION

                      NORTH     8:00 AM  0 0.86             115  161    0  276          42%  58%   0%
                       EAST                0.58              33    0   37   70          47%   0%  53%
                      SOUTH                0.84               0  118  132  250           0%  47%  53%
                       WEST                0.51              14    0   31   45          31%   0%  69%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2R12A      Z-59(108)  (17csi)  L:97   #N-343.2
--------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 12 - NEWTON, MASSACHUSETTS      Secondary Movement:    TRUCKS         Date : THURSDAY
Major St. :  MORE DRIVE                                                                       FEBRUARY 13, 1992
Minor St. :  GATE SOUTH OF EDmond HALL - DRIVE SOUTH OF WALSH HALL
--------------------------------------------------------------------------------------------------------------
                   MORE DRIVE       GATE S. OF EDmonds       MORE DRIVE          DWY. S. OF WALSH HALL
   TIME       .... FROM NORTH ....  .... FROM WEST ....   .... FROM SOUTH ....    .... FROM WEST ....   VEHICLE
BEGIN         RT-W RT-E THRU  LT         RT THRU  LT          RT THRU LT-E LT-W      RT THRU  LT     TOTAL
---------------------------------------------------------------------------------------------------------------
 7:45  AM        0    1    0    0         3    0    2           0    0    0 5        3    0    0

 8:00  AM        0    4    0    0         4   10    6           0    0    2 6        6    0    3        41
 8:15            3    1    0    0         0    3    2           0    0    0 0        0    0    0         9
 8:30            0    1    0    0         0    5    0           0    0    0 0        0    0    0         6
 8:45            0    0    0    0         4    6    0           0    4    0 0        1    0    0        15
------        ---- ---- ---- ----      ---- ---- ----        ---- ---- ---- ----   ---- ---- ----    ------
HR TOTAL         3    6    0    0         8   24    8           0    4    2 6        7    0    3        71

 9:00   AM       0    0    0    0         0    6    0           0    1    0 0        0    0    0         7
 9:15            0    3    0    0         2   10    1           0    0    0 0        0    0    1        17
 9:30            0    5    0    0         3    5    0           0    1    0 0        2    0    0        16
 9:45            2    1    0    0         2    6    0           0    3    0 0        1    0    0        15
------        ---- ---- ---- ----      ---- ---- ----        ---- ---- ---- ----   ---- ---- ----    ------
HR TOTAL         2    9    0    0         7   27    1           0    5    0 0        3    0    1        55

10:00   AM       1    0    0    0         3    5    0           0    0    1 0        0    0    0        10
10:15            0    1    0    0         3    5    0           0    1    0 0        0    0    0    .   10
10:30            1    3    0    0         1    4    2           0    1    1 0        0    0    0        13
10:45            0    0    0    0         0    0    0           0    0    0 0        0    0    0         0
------        ---- ---- ---- ----      ---- ---- ----        ---- ---- ---- ----   ---- ---- ----    ------
HR TOTAL         2    4    0    0         7   14    2           0    2    2 0        0    0    0        33



--------------------------------------------------------------------------------------------------------------

DAY TOTAL        7   19    0    0        25   65   13           0   11    4 11      13    0    4       159
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------

FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2R12P      Z-59(108)  (17csi)  L:97   #N-343.2  A1-BL99
------------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 12 - NEWTON, MASSACHUSETTS           Sum Movements: ALL VEHICLES      Date : THURSDAY
Major St. :  MORE DRIVE                                                                       FEBRUARY 13, 1992
Minor St. :  GATE SOUTH OF EDMOND HALL - DRIVE SOUTH OF WALSH HALL
-----------------------------------------------------------------------------------------------------------------------

                 MORE DRIVE       GATE S. OF EDMONDS     MORE DRIVE          DWY. S. OF WALSH HALL
 TIME         .... FROM NORTH ....  .... FROM WEST ....   .... FROM SOUTH ....    .... FROM WEST ....     VEHICLE
BEGIN     PED RT-W RT-E THRU   LT         RT THRU   LT     PED   RT THRU LT-E LT-W     RT THRU   LT     TOTAL
----------------------------------------------------------------------------------------  ----------------------------

 3:45  PM  0    1   10   70    0          25    0   12       1    0   69   27  0        2    0    1       217

 4:00  PM  0    1   17   54    0          26    0   21       0    0   26   30  0        1    0    2       178
 4:15      2   13    4   79    0          39    0   27       1    0   28   34  5        2    0    6       237
 4:30      0    3   11   66    0          27    0   13       3    0   60   23  6        0    0    6       215
 4:45      0   10    8   72    0          24    0   18       3    0   31   12  4        2    0    1       182
------    --- ---- ---- ---- ----        ---- ---- ----    ---- ---- ---- ---- ----    ---- ---- ----    -----
HR TOT     2   27   40  271    0         116    0   79       7    0  145   99 15        5    0   15       812

 5:00      0    2   15   57    0          25    0   27       1    0   28   24  2        0    0    5       185
 5:15      0    4    5   68    0          20    0   28      15    0   25   24  4        1    0    0       179
 5:30      0    5   10   56    0          23    0   14       3    0   36   23  2        1    0    1       171
 5:45      0   10   15   59    0          23    0   15       0    0   38   23  0        1    0    6       190
------    --- ---- ---- ---- ----        ---- ---- ----    ---- ---- ---- ---- ----    ---- ---- ----    ------
HR TOT     0   21   45  240    0          91    0   84      19    0  127   94  8        3    0   12       725

 6:00      0    8    9   39    0          12    0   13       0    0   36   14  5        4    0    3       143
 6:15      0    4   10   49    0          25    0   27       0    0   35   25  0        0    0    1       176
 6:30      0    5   10   60    0          25    0   28       0    0   32   32  0        0    0    0       192
 6:45      0    0    4    0    0          15    0   15       0    0   31   24  0        3    0    0        92
------    --- ---- ---- ---- ----        ---- ---- ----    ---- ---- ---- ---- ----    ---- ---- ----    ------
HR TOT     0   17   33  148    0          77    0   83       0    0  134   95  5        7    0    4       603

 7:00      0    5    8    0    0          17    0   19       0    0   33    5  3        0    0    0        90

-----------------------------------------------------------------------------------------------------------------------
DAY TO     2   71  136  729    0         326    0  277      27    0  508  320 31       17    0   32      2447

                                        PEAK PERIOD ANALYSIS FOR THE PERIOD:     3:45 TO  7:15  PM

                      DIRECTION  START     PEAK HR   .........VOLUMES...........    .....PERCENTS.....
                        FROM    PEAK HR    FACTOR      --     RT THRU  LFT   TOT     --   RT THRU  LFT
                      ---------------------------------------------------------   ------------------
                      NORTH      4:15 PM  0 0.94               38  274    0  312         12%  88%   0%
                       EAST      4:15 PM  0 0.76              115    0   85  200         58%   0%  43%
                      SOUTH      3:45 PM  0 0.77                0  183  114  297          0%  62%  38%
                       WEST      4:15 PM  0 0.69                4    0   18   22         18%   0%  82%

                                            0.86           ENTIRE INTERSECTION

                      NORTH      3:45 PM  0 0.94               42  269    0  311         14%  86%   0%
                       EAST                 0.72              117    0   73  190         62%   0%  38%
                      SOUTH                 0.77                0  183  114  297          0%  62%  38%
                       WEST                 0.39                5    0   15   20         25%   0%  75%
```

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC-2R12P      Z-59(108)  (17csi)  L:97   #N-343.2
------------------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION # 12 - NEWTON, MASSACHUSETTS       Secondary Movement:    TRUCKS         Date : THURSDAY
Major St. :  MORE DRIVE                                                                        FEBRUARY 13, 1992
Minor St. :  GATE SOUTH OF EDMOND HALL - DRIVE SOUTH OF WALSH HALL
------------------------------------------------------------------------------------------------------------------------
                  MORE DRIVE        GATE S. OF EDMONDS      MORE DRIVE          DWY. S. OF WALSH HALL
    TIME      .... FROM NORTH ....  .... FROM WEST ....   .... FROM SOUTH ....   .... FROM WEST ....   VEHICLE
   BEGIN       RT-W RT-E THRU   LT          RT THRU   LT          RT THRU LT-E LT-W      RT THRU   LT    TOTAL
--------------------------------------------------------------------------------------------------------------------------
  3:45  PM       1    1    0    0            1    0    0           0    0    0  0        0    0    0        3

  4:00  PM       0    0    0    0            1    0    0           0    0    0  1        0    0    0        2
  4:15           1    0    0    0            0    0    0           0    0    0  0        0    0    0        1
  4:30           0    0    0    0            0    0    0           0    0    0  0        0    0    0        0
  4:45           0    0    0    0            0    0    0           0    0    0  0        0    0    0        0
 ------        ---- ---- ---- ----         ---- ---- ----        ---- ---- ---- ----    ---- ---- ----    ------
 HR TOTAL        1    0    0    0            1    0    0           0    0    0  1        0    0    0        3

  5:00  PM       1    0    0    0            0    0    0           0    0    0  1        0    0    0        2
  5:15           1    0    0    0            1    0    0           0    0    0  0        0    0    1        3
  5:30           0    2    0    0            0    0    0           0    0    0  0        0    0    0        2
  5:45           0    4    0    0            0    0    0           0    0    1  0        0    0    0        5
 ------        ---- ---- ---- ----         ---- ---- ----        ---- ---- ---- ----    ---- ---- ----    ------
 HR TOTAL        2    6    0    0            1    0    0           0    0    1  1        0    0    1       12

  6:00  PM       0    0    0    0            0    0    0           0    0    0  0        0    0    0        0
  6:15           0    0    0    0            0    0    0           0    0    0  0        0    0    0        0
  6:30           0    0    0    0            1    0    0           0    0    0  1        0    0    1        3
  6:45           0    1    0    0            0    0    0           0    0    1  0        0    0    0        2
 ------        ---- ---- ---- ----         ---- ---- ----        ---- ---- ---- ----    ---- ---- ----    ------
 HR TOTAL        0    1    0    0            1    0    0           0    0    1  1        0    0    1        5

  7:00  PM       2    0    0    0            0    0    0           0    0    0  0        0    0    0        2

------------------------------------------------------------------------------------------------------------------------


 DAY TOTAL       6    8    0    0            4    0    0           0    0    2  3        0    0    2       25
```

MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY

FOR: RIZZO ASSOCIATES, INC.
BY: NORTHEAST TRAFFIC COUNTS
FILE: BC2RGATA Y-43 (17csi) L:96 #N-343.2

SITE CODE : LOCATION - BOSTON COLLEGE NEWTON, MASSACHUSETTS
Major St. : GATE COUNTS - IN AND OUT
Minor St. : GATES AS NOTED

Date : THURSDAY
FEBRUARY 13, 1992
Sum Movements: ALL VEHICLES

	BEACON ST.-GARAGE			MORE DR.-EDmund			ST. IGNATIUS GATE			TOTAL THREE GATES		
TIME	C STICKERS	TOTAL		C STICKERS	TOTAL		C STICKERS	TOTAL		C STICKERS	TOTAL	
BEGIN	IN	IN	OUT	IN	IN	OUT	IN	IN	OUT	~~OUT~~ IN	IN	OUT
7:45 AM	10	26	5	6	25	12	5	19	12	21	70	29
8:00 AM	23	64	0	7	27	11	11	44	14	41	135	25
8:15	23	57	1	13	43	3	14	65	18	50	165	22
8:30	36	70	1	23	51	11	54	119	16	113	240	28
8:45	55	113	5	44	82	12	54	121	19	153	316	36
HR TOTAL	137	304	7	87	203	37	133	349	67	357	856	111
9:00 AM	17	61	5	7	22	3	23	51	12	47	134	20
9:15	9	41	2	19	43	9	12	40	16	40	124	27
9:30	19	50	3	8	25	11	15	36	16	42	111	30
9:45	23	43	3	10	16	10	13	36	16	46	95	29
HR TOTAL	68	195	13	44	106	33	63	163	60	175	464	106
10:00 AM	28	49	6	8	22	10	25	58	8	61	129	24
10:15	27	37	17	38	54	30	31	59	33	96	150	80
10:30	13	19	10	8	17	14	14	35	16	35	71	40
10:45	0	0	0	0	0	0	0	0	0	0	0	0
HR TOTAL	68	105	33	54	93	54	70	152	57	192	350	144
DAY TOTAL	283	630	58	191	427	136	271	683	196	745	1740	390

```
MANUAL TURN MOVEMENT COUNT - 15 MINUTE SUMMARY
----------------------------------------------
FOR:  RIZZO ASSOCIATES, INC.
BY:   NORTHEAST TRAFFIC COUNTS
FILE: BC2RGATP      Y-43  (17csi)  L:96   #N-343.2            A1-BL99
------------------------------------------------------------------------------------------------------------
SITE CODE :  LOCATION  - BOSTON COLLEGE -  NEWTON, MASSACHUSETTS        Date :    THURSDAY
Major St. :  GATE COUNTS - IN AND OUT                                   FEBRUARY 13, 1992
Minor St. :  GATES AS NOTED                                         Sum Movements: ALL VEHICLES
------------------------------------------------------------------------------------------------------------

               BEACON ST.-GARAGE        MORE DR.-EDMOND          ST. IGNATIUS GATE        TOTAL THREE GATES
 TIME         C STICKERS   TOTAL      C STICKERS   TOTAL      C STICKERS   TOTAL      C STICKERS   TOTAL
BEGIN            OUT       IN  OUT       OUT       IN  OUT       OUT       IN  OUT       OUT       IN  OUT
----------------------------------------------------------------------------------------------------------------

 3:45   PM       13        33   35       14        21   37        8        63   56       35       117  128

 4:00   PM       21        38   52       22        35   53       19        53   51       62       126  156
 4:15            36        43   58       32        29   65       29        48   83       97       120  206
 4:30            11        26   49       20        23   39       24        35   63       55        84  151
 4:45             9        22   61       13        19   52       14        28   62       36        69  175
------          ----      ---- ----     ----      ---- ----     ----      ---- ----     ----      ---- ----
HR TOTAL         77       129  220       87       106  209       86       164  259      250       399  688

 5:00   PM       12         7   53       13        27   58       10        40   71       35        74  182
 5:15            11        17   47       20        20   59        3        45   51       34        82  157
 5:30            12        11   29       16        28   41       15        46   51       43        85  121
 5:45             4        13   25        7        23   30        8        40   38       19        76   93
------          ----      ---- ----     ----      ---- ----     ----      ---- ----     ----      ---- ----
HR TOTAL         39        48  154       56        98  188       36       171  211      131       317  553

 6:00   PM       12        30   44       10        29   35       11        44   53       33       103  132
 6:15            43        48   87       27        46   57       10        64   54       80       158  198
 6:30            30        23   59       14        35   52       14        68   48       58       126  159
 6:45            15        11   35        9        29   31        9        63   38       33       103  104
------          ----      ---- ----     ----      ---- ----     ----      ---- ----     ----      ---- ----
HR TOTAL        100       112  225       60       139  175       44       239  193      204       490  593

 7:00   PM       17        15   34        9        13   35        9        33   54       35        61  123

------------------------------------------------------------------------------------------------------------
DAY TOTAL       246       337  668      226       377  644      183       670  773      655      1384 2085
```

CAPACITY ANALYSIS – EXISTING CONDITION

```
NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:14:31
omas More Dr./Chestnut Hill Dr. - Exist.  Cond. 1992 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=team       GEOMETRICS=team
Y: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Chestnut Hill
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
               LT   TH  RT    LT   TH   RT   LT   TH   RT
LUME            0  270  160    7  221    0   95    0   25
F               0.95           0.89           0.85
J VOLUME        0  284  168    8  248    0  112    0   29
RCENT GRADE     0.00           0.00           0.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00          99.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           1.00           0.00
SS CAR/HR       0              8            112    0   29


EP 1 RIGHT TURNS FROM     C:Chestnut Hill
NFLICTING FLOWS                      368
ITICAL GAPS                          5.5
PACITY                               732
TUAL CAPACITY                        732


EP 2 LEFT TURNS FROM     B:Thomas More
NFLICTING FLOWS                      453
ITICAL GAPS                          5.0
PACITY                               752
PACITY USED                            1%
PEDANCE FACTOR                      1.00
TUAL CAPACITY                        752
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992               TIME:21:14:31
Thomas More Dr./Chestnut Hill Dr. - Exist.  Cond. 1992 AM Peak Hour


STEP 3 LEFT TURNS FROM      C:Chestnut Hill
CONFLICTING FLOWS                       625
CRITICAL GAPS                           6.5
CAPACITY                                406
ACTUAL CAPACITY                         405


                      SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                   8        752       745     A       4.84         0

ALL MOVES FROM C:          141        446       305     B      11.80         0
```

```
 CH PROGRAM VERSION DATE 4-29-1988
 5 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
 E:02-27-1992.            TIME:21:18:30
 omas More Dr./Chestnut Hill Dr. - Exist. PM Peak Hour


 T DATASETS LOADED OR SAVED
 UME=tepm       GEOMETRICS=tepm
 : A- -B
     |
     C
 ERAL CHARACTERISTICS
 ULATION GREATER THAN 250,000: YES
 NTROLS: FROM C: STOP
 EVAILING SPEED:  30  MPH
 N STREET # OF LANES: 2 LANES
 N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

 NOR STREET LANES
 ROACH: C: Chestnut Hill
 RED LEFT AND RIGHT TURN LANE: YES
 GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
 HT TURN ACCELERATION LANE ON MAJOR: NO


 HT DISTANCE RESTRICTIONS (in seconds)
 ROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
 TS             0.00           0.00           0.00
 US             0.00           0.00           0.00
 HTS            0.00           0.00           0.00


 ROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
               LT   TH   RT   LT   TH   RT   LT   TH   RT
 UME            0  243  145   34  337    0   86    0   30
                0.85           0.85           0.88
  VOLUME        0  286  171   40  396    0   98    0   34
 CENT GRADE     0.00           0.00           0.00
 CENT CYCLES      0.00           0.00           0.00
 SENGER CARS     99.00          99.00          %100.00
 CENT LT TRU      0.00           0.00           0.00
 CENT HV TRU      1.00           1.00           0.00
 S CAR/HR       0             40             98    0   34


 P 1 RIGHT TURNS FROM     C:Chestnut Hill
 FLICTING FLOWS                      371
 TICAL GAPS                          5.0
 ACITY                               822
 UAL CAPACITY                        822


 P 2 LEFT TURNS FROM     B:Thomas More
 FLICTING FLOWS                      456
 TICAL GAPS                          4.5
 ACITY                               858
 ACITY USED                            5%
 EDANCE FACTOR                      0.98
 UAL CAPACITY                        858
```

```
1985 HCM : CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES  PAGE 2 OF 2
DATE:02-27-1992                TIME:21:18:30
Thomas More Dr./Chestnut Hill Dr. - Exist. PM Peak Hour


STEP 3 LEFT TURNS FROM       C:Chestnut Hill
CONFLICTING FLOWS                        808
CRITICAL GAPS                            6.0
CAPACITY                                 361
ACTUAL CAPACITY                          352


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                 40         858       818     A      4.40          0

ALL MOVES FROM C:         132         413       282     C     12.79          0.
```

```
ICH PROGRAM VERSION DATE 4-29-1988
35 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
E:02-27-1992             TIME:21:03:31
acon St./Chestnut Hill Dr. & Rd. - Exist. Cond. 1992 AM Peak Hour


T DATASETS LOADED OR SAVED
LUME=hceam      GEOMETRICS=bceam
/:   D
     |
  A-  -B
     |
     C
ERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
TROLS: FROM C: STOP
       FROM D: STOP
       FROM D RT LANE: STOP
VAILING SPEED:  30  MPH
N STREET # OF LANES: 2 LANES
N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
N STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

IOR STREET LANES

ROACH: C: Chest. Rd.
LUSIVE LEFT TURN LANES: NO
LUSIVE RIGHT TURN LANES: NO
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
HT TURN ACCELERATION LANE ON MAJOR: NO

ROACH: D: Chest. Dr.
LUSIVE LEFT TURN LANES: NO
LUSIVE RIGHT TURN LANES: YES
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
HT TURN ACCELERATION LANE ON MAJOR: NO

HT DISTANCE RESTRICTIONS (in seconds)
ROACH         A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
TS              0.00           0.00           0.00           0.00
US              0.00           0.00           0.00           0.00
HTS             0.00           0.00           0.00           0.00


ROACH         A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
               LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME          341  555    5    0  512   83    0    6    3   53    3  260
F               0.85           0.85           0.85           0.89
I VOLUME      401  653    6    0  602   98    0    7    4   60    3  292
RCENT GRADE     0.00           0.00          -3.00
RCENT CYCLES      0.00           0.00           0.00           0.00
SSENGER CARS     98.00          98.00          %100.00          99.00
RCENT LT TRU      0.00           0.00           0.00           0.00
RCENT HV TRU      2.00           2.00           0.00           1.00
SS CAR/HR     409              0              0    6    3   60    3  295


P 1 RIGHT TURNS FROM      C:Chest. Rd.             D:Chest. Dr.
FLICTING FLOWS                       656                 602
TICAL GAPS                           5.0                 4.5
ACITY                                599                 741
ACITY USED                             1%                 40%
EDANCE FACTOR                       1.00                0.68
UAL CAPACITY                         599                 741
```

```
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:02-27-1992             TIME:21:03:31
Beacon St./Chestnut Hill Dr. & Rd. - Exist. Cond. 1992 AM Peak Hour

STEP 2 LEFT TURNS FROM      B:Beacon WB                A:Beacon EB
CONFLICTING FLOWS                      659                    602
CRITICAL GAPS                          5.0                    5.0
CAPACITY                               597                    637
CAPACITY USED                            0%                    64%
IMPEDANCE FACTOR                      1.00                   0.43
ACTUAL CAPACITY                        597                    637


STEP 3 THRU MOVES FROM      C:Chest. Rd.               D:Chest. Dr.
CONFLICTING FLOWS                     1659                   1662
CRITICAL GAPS                          6.0                    6.0
CAPACITY                                95                     94
CAPACITY USED                            6%                     4%
IMPEDANCE FACTOR                      0.96                   0.98
ACTUAL CAPACITY                         40                     40


STEP 4 LEFT TURNS FROM      C:Chest. Rd.               D:Chest. Dr.
CONFLICTING FLOWS                     1955                   1673
CRITICAL GAPS                          6.5                    6.5
CAPACITY                                41                     71
ACTUAL CAPACITY                         12                     29


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                        DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM A:                       409        637       228      C     15.79         1.

ALL MOVES FROM C:                  9         59        50      E     72.71         0.

RT FROM D:                       295        741       446      A      8.07         0.
SHARED LT/TH FROM D:              64         30       -34      F   INFINITE     INFINI
```

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HCM PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
E:02-27-1992              TIME:21:10:57
acon St./Chestnut Hill Dr. & Rd. - Exist. Cond. 1992 PM Peak Hour


T DATASETS LOADED OR SAVED
LUME=bcepm        GEOMETRICS=bcepm
E:    D
      |
   A-   -B
      |
      C
ERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
TROLS: FROM C: STOP
        FROM D: STOP
        FROM D RT LANE: STOP
VAILING SPEED:  30  MPH
N STREET # OF LANES: 2 LANES
N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
N STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

IOR STREET LANES

ROACH: C: Chest. Rd.
LUSIVE LEFT TURN LANES: NO
LUSIVE RIGHT TURN LANES: NO
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
HT TURN ACCELERATION LANE ON MAJOR: NO

ROACH: D: Chest. Dr.
LUSIVE LEFT TURN LANES: NO
LUSIVE RIGHT TURN LANES: YES
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
HT TURN ACCELERATION LANE ON MAJOR: NO

HT DISTANCE RESTRICTIONS (in seconds)
ROACH          A: Beacon EB    B: Beacon WB    C: Chest. Rd.   D: Chest. Dr.
TS                0.00            0.00            0.00            0.00
US                0.00            0.00            0.00            0.00
HTS               0.00            0.00            0.00            0.00


ROACH          A: Beacon EB    B: Beacon WB    C: Chest. Rd.   D: Chest. Dr.
                LT   TH   RT    LT   TH   RT    LT   TH   RT    LT   TH   RT
UME            298  495    4     2  594   89     4    1    5    81    7  335
                 0.85            0.89            0.85            0.85
 VOLUME        351  582    5     2  667  100     5    1    6    95    8  394
CENT GRADE       0.00            0.00           -3.00
CENT CYCLES        0.00            0.00            0.00            0.00
SENGER CARS       99.00           98.00          %100.00           99.00
CENT LT TRU        0.00            0.00            0.00            0.00
CENT HV TRU        1.00            2.00            0.00            1.00
S CAR/HR       354               2               4    1    5    96    8  398


P 1 RIGHT TURNS FROM      C:Chest. Rd.              D:Chest. Dr.
FLICTING FLOWS                     585                   667
TICAL GAPS                         5.0                   4.5
ACITY                              650                   693
ACITY USED                          1%                   57%
EDANCE FACTOR                     1.00                  0.50
UAL CAPACITY                       650                   693
```

```
1985 HCM: CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:02-27-1992              TIME:21:10:57
Beacon St./Chestnut Hill Dr. & Rd. - Exist. Cond. 1992 PM Peak Hour

STEP 2 LEFT TURNS FROM      B:Beacon WB                A:Beacon EB
CONFLICTING FLOWS                   587                        667
CRITICAL GAPS                       5.0                        5.0
CAPACITY                            648                        592
CAPACITY USED                        0%                        60%
IMPEDANCE FACTOR                   1.00                       0.47
ACTUAL CAPACITY                     648                        592


STEP 3 THRU MOVES FROM      C:Chest. Rd.               D:Chest. Dr.
CONFLICTING FLOWS                  1605                       1607
CRITICAL GAPS                       6.0                        6.0
CAPACITY                            104                        104
CAPACITY USED                        1%                         8%
IMPEDANCE FACTOR                   1.00                       0.95
ACTUAL CAPACITY                      49                         49


STEP 4 LEFT TURNS FROM      C:Chest. Rd.               D:Chest. Dr.
CONFLICTING FLOWS                  2007                       1614
CRITICAL GAPS                       6.5                        6.5
CAPACITY                             36                         80
ACTUAL CAPACITY                       8                         37


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM A:                  354         592      237     C      15.16       1
LT FROM B:                    2         648      646     A       5.57       0

ALL MOVES FROM C:            10          19        9     E     383.47       1

RT FROM D:                  398         693      295     C      12.20       1
SHARED LT/TH FROM D:        105          38      -66     F   INFINITE    INFIN
```

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NCH PROGRAM VERSION DATE 4-29-1988
35 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992            TIME:21:45:54
acon St./BC Dr. - Exist. Cond. 1992 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=geam      GEOMETRICS=geam
/: A- -B
    |
    C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
       FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: BC Dr.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH       A: Beacon WB   B: Beacon EB   C: BC Dr.
FTS            0.00           0.00           0.00
RUS            0.00           0.00           0.00
GHTS           0.00           0.00           0.00


PROACH       A: Beacon WB   B: Beacon EB   C: BC Dr.
              LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME           0  682   90  197  940    0    5    0   13
               0.85           0.85           0.85
 VOLUME        0  802  106  232 1106    0    6    0   15
RCENT GRADE    0.00           0.00           1.00
RCENT CYCLES     0.00           0.00           0.00
SSENGER CARS    98.00          98.00          %100.00
RCENT LT TRU     0.00           0.00           0.00
RCENT HV TRU     2.00           2.00           0.00
SS CAR/HR      0            236              6    0   17


EP 1 RIGHT TURNS FROM     C:BC Dr.
NFLICTING FLOWS                    855
ITICAL GAPS                        5.0
PACITY                             474
TUAL CAPACITY                      474


EP 2 LEFT TURNS FROM     B:Beacon EB
NFLICTING FLOWS                    908
ITICAL GAPS                        4.5
PACITY                             535
PACITY USED                         44%
PEDANCE FACTOR                    0.63
TUAL CAPACITY                      535
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992              TIME:21:45:54
Beacon St./BC Dr. - Exist. Cond. 1992 AM Peak Hour


STEP 3 LEFT TURNS FROM      C:BC Dr.
CONFLICTING FLOWS                        2193
CRITICAL GAPS                             6.0
CAPACITY                                   33
ACTUAL CAPACITY                            21


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE  LOS  AVG DEL(SEC) AVG

LT FROM B:                236        535       299    C      12.05          0

LT FROM C:                  6         21        15    E     244.31         16.
RT FROM C:                 17        474       457    A       7.87          0
```

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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992            TIME:22:01:33
acon St./BC Dr. - Exist. Cond. - 1992 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=gepm      GEOMETRICS=gepm
/: A- -B
    |
    C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: BC Dr.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH       A: Beacon WB   B: Beacon EB   C: BC Dr.
FTS            0.00           0.00           0.00
RUS            0.00           0.00           0.00
GHTS           0.00           0.00           0.00


PROACH       A: Beacon WB   B: Beacon EB   C: BC Dr.
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME           0   880   53   90  729   0    68   0   156
               0.89           0.85           0.85
  VOLUME       0   989   60  106  858   0    80   0   184
RCENT GRADE    0.00           0.00           1.00
RCENT CYCLES     0.00           0.00           0.00
SSENGER CARS    98.00          99.00          %100.00
RCENT LT TRU     0.00           0.00           0.00
RCENT HV TRU     2.00           1.00           0.00
SS CAR/HR      0             107             88   0   202


EP 1 RIGHT TURNS FROM    C:BC Dr.
NFLICTING FLOWS                     1019
ITICAL GAPS                          5.0
PACITY                               388
TUAL CAPACITY                        388


EP 2 LEFT TURNS FROM    B:Beacon EB
NFLICTING FLOWS                     1048
ITICAL GAPS                          4.5
PACITY                               457
PACITY USED                           23%
PEDANCE FACTOR                      0.83
TUAL CAPACITY                        457
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992            TIME:22:01:33
Beacon St./BC Dr. - Exist. Cond. - 1992 PM Peak Hour


STEP 3 LEFT TURNS FROM     C:BC Dr.
CONFLICTING FLOWS                     1982
CRITICAL GAPS                          6.0
CAPACITY                                52
ACTUAL CAPACITY                         43


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT               DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:               107        457       350      B    10.29          0

LT FROM C:                88         43       -45      F   INFINITE     INFIN
RT FROM C:               202        388       186      D    19.36          0
```

```
HCM PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:27:30
acon St./Reservoir Ave.  - Exist. Cond. 1992 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=ream          GEOMETRICS=ream
/: A- -B
    |
    C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Reservoir St.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH          A: Beacon St.  B: Beacon St.  C: Reservoir S
FTS                0.00           0.00           0.00
RUS                0.00           0.00           0.00
GHTS               0.00           0.00           0.00


PROACH          A: Beacon St.  B: Beacon St.  C: Reservoir S
                 LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME              0  925    0    0  682    0   12    0  212
                   0.85           0.85           0.85
 VOLUME           0 1088    0    0  802    0   14    0  249
CENT GRADE         0.00           0.00          -2.00
CENT CYCLES          0.00           0.00           0.00
SSENGER CARS        98.00          98.00         %100.00
CENT LT TRU          0.00           0.00           0.00
CENT HV TRU          2.00           2.00           0.00
SS CAR/HR         0              0              13    0  224


EP 1 RIGHT TURNS FROM      C:Reservoir St.
NFLICTING FLOWS                       1088
ITICAL GAPS                            5.0
PACITY                                 355
TUAL CAPACITY                          355


EP 2 LEFT TURNS FROM      B:Beacon St. WB
NFLICTING FLOWS                       1088
ITICAL GAPS                            4.5
PACITY                                 436
PACITY USED                              0%
PEDANCE FACTOR                        1.00
TUAL CAPACITY                          436
```

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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2
DATE:02-27-1992                TIME:21:27:30
Beacon St./Reservoir Ave. - Exist. Cond. 1992 AM Peak Hour


STEP 3 LEFT TURNS FROM       C:Reservoir St.
CONFLICTING FLOWS                       1891
CRITICAL GAPS                            6.0
CAPACITY                                  62
ACTUAL CAPACITY                           62


                      SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG


LT FROM C:                  13          62        49     E      73.26
RT FROM C:                 224         355       130     D      27.59
```

```
ICH PROGRAM VERSION DATE 4-27-1988
5 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
E:02-27-1992              TIME:21:38:58
con St./Reservoir Ave. - Exist. Cond. 1992 PM Peak Hour


T DATASETS LOADED OR SAVED
UME=repm        GEOMETRICS=repm
: A- -B
     |
     C
ERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
TROLS: FROM C: STOP
        FROM C RT LANE: STOP
VAILING SPEED:  30  MPH
N STREET # OF LANES: 2 LANES
N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

OR STREET LANES
ROACH: C: Reservoir St.
RED LEFT AND RIGHT TURN LANE: NO
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
HT TURN ACCELERATION LANE ON MAJOR: NO


HT DISTANCE RESTRICTIONS (in seconds)
ROACH          A: Beacon St.   B: Beacon St.   C: Reservoir S
TS               0.00            0.00            0.00
US               0.00            0.00            0.00
HTS              0.00            0.00            0.00


ROACH          A: Beacon St.   B: Beacon St.   C: Reservoir S
                LT   TH   RT    LT   TH   RT    LT   TH   RT
UME              0  727    0     0 1036    0    14    0   92
                0.85            0.89            0.85
 VOLUME          0  855    0     0 1164    0    16    0  108
CENT GRADE      0.00 .          0.00           -2.00
CENT CYCLES       0.00            0.00            0.00
SENGER CARS      99.00           98.00          %100.00
CENT LT TRU       0.00            0.00            0.00
CENT HV TRU       1.00            2.00            0.00
S CAR/HR         0               0              15    0   97


P 1 RIGHT TURNS FROM      C:Reservoir St.
FLICTING FLOWS                       855
TICAL GAPS                           5.0
ACITY                                474
UAL CAPACITY                         474


P 2 LEFT TURNS FROM      B:Beacon St. WB
FLICTING FLOWS                       855
TICAL GAPS                           4.5
ACITY                                567
ACITY USED                            0%
EDANCE FACTOR                       1.00
UAL CAPACITY                         567
```

```
HCS: PKM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES PAGE 2 OF 2
DATE:02-27-1992                TIME:21:38:58
Beacon St./Reservoir Ave  - Exist. Cond. 1992 PM Peak Hour


STEP 3 LEFT TURNS FROM       C:Reservoir St.
CONFLICTING FLOWS                        2019
CRITICAL GAPS                             6.0
CAPACITY                                   48
ACTUAL CAPACITY                            48


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG (


LT FROM C:                 15         48        33     E    108.32           0.
RT FROM C:                 97        474       377     B      9.56           0.
```

```
ICH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
E:02-27-1992               TIME:20:54:23
monwealth Ave./Fr. Herlihy Terr -  Exist. 1992 AM Peak Hour


T DATASETS LOADED OR SAVED
LUME=heam          GEOMETRICS=heam
: A- -B
     |
     C
ERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
TROLS: FROM C: STOP
VAILING SPEED:  30  MPH
N STREET # OF LANES: 4 LANES
N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

IOR STREET LANES
ROACH: C: Fr. Herl.
RED LEFT AND RIGHT TURN LANE: YES
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
HT TURN ACCELERATION LANE ON MAJOR: NO


HT DISTANCE RESTRICTIONS (in seconds)
ROACH        A: Comm. EB    B: Comm. WB    C: Fr. Herl.
TS             0.00           0.00           0.00
US             0.00           0.00           0.00
HTS            0.00           0.00           0.00


ROACH        A: Comm. EB    B: Comm. WB    C: Fr. Herl.
              LT   TH   RT   LT   TH   RT   LT   TH   RT
UME            0  859  229   30  585    0    0    0    1
               0.85           0.85           0.80
 VOLUME        0 1011  269   35  688    0    0    0    1
CENT GRADE    -1.00           0.00           1.00
CENT CYCLES      0.00           0.00           0.00
SENGER CARS     98.00          96.00          %100.00
CENT LT TRU      0.00           0.00           0.00
CENT HV TRU      2.00           4.00           0.00
S CAR/HR       0             37              0    0    1


P 1 RIGHT TURNS FROM     C:Fr. Herl.
FLICTING FLOWS                      640
TICAL GAPS                          5.0
ACITY                               610
UAL CAPACITY                        610


P 2 LEFT TURNS FROM     B:Comm. WB
FLICTING FLOWS                     1280
TICAL GAPS                          5.0
ACITY                               276
ACITY USED                           13%
EDANCE FACTOR                      0.91
UAL CAPACITY                        276
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992              TIME:20:54:23
Commonwealth Ave./Fr. Herlihy Terr -  Exist. 1992 AM Peak Hour


STEP 3 LEFT TURNS FROM       C:Fr. Herl.
CONFLICTING FLOWS                      1869
CRITICAL GAPS                           6.5
CAPACITY                                 49
ACTUAL CAPACITY                          44


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                 37          276       239      C      15.06          0

ALL MOVES FROM C:           1          610       609      A       5.91          0
```

```
CM PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992                 TIME:08:03:59
mmonwealth Ave./Fr. Herlihy Terr. - Exist. Cond. 1992 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=hepm        GEOMETRICS=hepm
: A- -B
    |
    C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 4 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Fr. Herl.
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH         A: Comm. EB     B: Comm. WB     C: Fr. Herl.
FTS              0.00            0.00            0.00
RUS              0.00            0.00            0.00
GHTS             0.00            0.00            0.00


PROACH         A: Comm. EB     B: Comm. WB     C: Fr. Herl.
                LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME             0  644  134   21  805    0    0    0    1
                 0.88           0.91            0.80
 VOLUME          0  732  152   23  885    0    0    0    1
RCENT GRADE     -1.00           0.00            1.00
RCENT CYCLES       0.00            0.00            0.00
SSENGER CARS      99.00           98.00          %100.00
RCENT LT TRU       0.00            0.00            0.00
RCENT HV TRU       1.00            2.00            0.00
SS CAR/HR        0              24              0    0    1


EP 1 RIGHT TURNS FROM      C:Fr. Herl.
NFLICTING FLOWS                      442
ITICAL GAPS                          5.0
PACITY                               761
TUAL CAPACITY                        761


EP 2 LEFT TURNS FROM      B:Comm. WB
NFLICTING FLOWS                      884
ITICAL GAPS                          5.0
PACITY                               458
PACITY USED                            5%
PEDANCE FACTOR                      0.97
TUAL CAPACITY                        458
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992               TIME:08:03:59
Commonwealth Ave./Fr. Herlihy Terr. - Exist. Cond. 1992 PM Peak Hour


STEP 3 LEFT TURNS FROM      C:Fr. Herl.
CONFLICTING FLOWS                     1716
CRITICAL GAPS                          6.5
CAPACITY                                66
ACTUAL CAPACITY                         64


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG (

LT FROM B:                 24        458       434      A       8.29         0.

ALL MOVES FROM C:           1        761       760      A       4.74         0.
```

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NCH PROGRAM VERSION DATE 4-29-1986
35 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
nmonwealth Ave./Lake St./St. Thomas More Dr.
xst. Cond. 1992 AM Peak Hour
 e:02-27-1992             time:19:54:23
ST DATA SET NAMES LOADED OR SAVED
 LUME=1eam      GEOMETRICS=1eam       SIGNAL=1eam
 CATED IN CBD:n
 LUME & GEOMETRICS
      VOLUMES      # OF LANES     LANE WIDTH     CROSS
R  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
  366   492   13    0  2  1     0.0 12.0 12.0     0
  293   550   50    1  2  0    10.0 10.0  0.0     0
   65   176   37    1  1  0    10.0 10.0  0.0     0
    0     1    1    0  1  0     0.0 12.0  0.0     0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK             PEDESTRIANS        ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
 -1.0%  2.0%   N     0    0   .850    0   n     7.0     3
  0.0%  4.0%   N     0    0   .850    0   n     7.0     3
  1.0%  3.0%   N     0    0   .850    0   n     7.0     3
  0.0%  0.0%   N     0    0   .900    0   n     7.0     3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
                          *  *  *     *  *  *     17.0    5    A
  *  *  *                                         30.0    5    A
     *  *                                         11.0    8    A
              *  *  *                             21.0    5    A

CLE= 102.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   366  492   13  .850   431  579   15
   293  550   50  .850   345  647   59
    65  176   37  .850    76  207   44
     0    1    1  .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP  FLOW N   LU     v  Plt  Prt
  LT-TH     1009 2 1.05 1060 0.43 0.00
  RT          15 1 1.00   15 0.00 1.00
  LT         345 1 1.00  345 1.00 0.00
  TH-RT      706 2 1.05  741 0.00 0.08
  LT          76 1 1.00   76 1.00 0.00
  TH-RT      251 1 1.00  251 0.00 0.17
  TH-RT        2 1 1.00    2 0.00 0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                OPPOSING APPROACH
ING OPPOSED       VOLUMES      % OPPOSING LEFT TURN    # LANES     OPPOSING
               LT   TH   RT        LT   TH   RT       LT  TH  RT    VOLUME
 STBOUND      345  647  59          0    0    0        1   2   0       0
 STBOUND      431  579  15          0    0    0        0   2   1       0
 RTHBOUND       0    1    1        100  100  100        0   1   0       2

URATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
  LT-TH     1800  2 1.000 0.990 1.005 1.000 1.000 1.000 1.000 1.000 3582
  RT        1800  1 1.000 0.990 1.005 1.000 1.000 1.000 0.850 1.000 1522
```

```
WB   TH-RT        1800  2 0.933 0.980 1.000 1.000 1.000 1.000 0.987 1.000 3253
NB   LT           1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB   TH-RT        1800  1 0.933 0.985 0.995 1.000 1.000 1.000 0.974 1.000 1604
SB   TH-RT        1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C    G   N    Va    Vm   Vlt   Plt No    Vo Plto
NB 102   17   1    76   251    76 1.00  1      2 0.00
CALCULATIONS
DIR Sop     Yo      Gu     Fs     Pl      Gq     Pt      Gf        El     Fm    Flt
NB 1800 0.001 16.895 0.874 1.000  0.105 0.000  0.000     1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s   v/s  g/C     c  v/c  CRITICAL
EB   LT-TH     1060 3582 0.30 0.45 1615 0.66      *
EB   RT          15 1522 0.01 0.45  687 0.02
WB   LT         345 1565 0.22 0.21  322 1.07
WB   TH-RT      741 3253 0.23 0.21  670 1.11      *
NB   LT          76 1647 0.05 0.17  274 0.28
NB   TH-RT      251 1604 0.16 0.17  267 0.94      *
SB   TH-RT        2 1499 0.00 0.17  250 0.01

CYCLE=102.0  LOST=18.0  SUM V/S CRIT= 0.68 TOTAL V/C= 0.83

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP   v/c  g/C    C      d1     c      d2    PF    Delay LOS Avg Q  95%
EB   LT-TH    0.66 0.45 102.0  16.59 1615    0.69 0.85    14.69   B   15.7
EB   RT       0.02 0.45 102.0  11.80  687    0.00 0.85    10.03   B    0.2
WB   LT       1.07 0.21 102.0  31.35  322   61.60 1.00    92.95   F   12.8
WB   TH-RT    1.11 0.21 102.0  31.66  670   63.81 0.85    81.15   F   23.9
NB   LT       0.28 0.17 102.0  28.23  274    0.15 0.85    24.12   C    1.8
NB   TH-RT    0.94 0.17 102.0  31.90  267   27.72 0.85    50.68   E    6.5
SB   TH-RT    0.01 0.17 102.0  26.96  250    0.00 0.85    22.91   C    0.1

DIR Delay LOS
EB   14.63   B
WB   84.89   F
NB   44.47   E
SB   22.91   C
INTERSECTION DELAY = 49.19 INTERSECTION LOS=E

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90   TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  63.3 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  16.5 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  13.2 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is  13.2 secs green,   8.0 secs yellow + red clear
suggested timing phase 4 is  24.1 secs green,   5.0 secs yellow + red clear
```

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ICH PROGRAM VERSION DATE 4-29-1988
5 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
monwealth Ave./Lake St./St. Thomas More Dr.
st. Cond. 1992 PM Peak Hour
e:02-27-1992              time:18:30:04
T DATA SET NAMES LOADED OR SAVED
UME=1epm        GEOMETRICS=1epm        SIGNAL=1epm
ATED IN CBD:n
UME & GEOMETRICS
      VOLUMES       # OF LANES       LANE WIDTH       CROSS
  LT    TH    RT     LT TH RT        LT    TH    RT     WALK
 242   403     5      0  2  1       0.0 12.0 12.0       0
 248   677    55      1  2  0      10.0 10.0  0.0       0
 149   299   107      1  1  0      10.0 10.0  0.0       0
   0     1     1      0  1  0       0.0 12.0  0.0       0

FFIC & ROADWAY CONDITIONS
                ADJ PARK                    PEDESTRIANS         ARR
 GRADE %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME TYPE
-1.0%  1.0%    N      0     0   .880    0    n     7.0    3
 0.0%  2.0%    N      0     0   .910    0    n     7.0    3
 1.0%  2.0%    N      0     0   .850    0    n     7.0    3
 0.0%  0.0%    N      0     0   .900    0    n     7.0    3

SINGS
 EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
 l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
                         *  *  *     *  *  *      15.0    5     A
 *  *  *                                          18.0    5     A
    *  *                                          10.0    8     A
             *  *  *                              26.0    5     A

LE=  92.0

UME ADJUSTMENT WORKSHEET
T 1 (MOVEMENT ADJUSTMENTS)
  LTV  THV  RTV   PHF  LTFR THFR RTFR
  242  403    5  .880   275  458    6
  248  677   55  .910   273  744   60
  149  299  107  .850   175  352  126
    0    1    1  .900     0    1    1

T 2 (LANE GROUP ADJUSTMENTS)
 LN GROUP   FLOW N   LU    v   Plt  Prt
 LT-TH       733 2 1.05  770 0.38 0.00
 RT            6 1 1.00    6 0.00 1.00
 LT          273 1 1.00  273 1.00 0.00
 TH-RT       804 2 1.05  845 0.00 0.08
 LT          175 1 1.00  175 1.00 0.00
 TH-RT       478 1 1.00  478 0.00 0.26
 TH-RT         2 1 1.00    2 0.00 0.50

T 3 (OPPOSING VOLUME ADJUSTMENTS)
T TURN                  OPPOSING APPROACH
NG OPPOSED          VOLUMES        % OPPOSING LEFT TURN       # LANES       OPPOSING
                  LT   TH   RT        LT    TH    RT          LT  TH  RT      VOLUME
TBOUND           273  744   60         0     0     0           1   2   0         0
TBOUND           275  458    6         0     0     0           0   2   1         0
THBOUND            0    1    1       100   100   100           0   1   0         2

URATION FLOW ADJUSTMENT WORKSHEET
```

```
EB  LT-TH      1800  2 1.000 0.995 1.005 1.000 1.000 1.000 1.000 1.000 3600
EB  RT         1800  1 1.000 0.995 1.005 1.000 1.000 1.000 0.850 1.000 1530
WB  LT         1800  1 0.933 0.990 1.000 1.000 1.000 1.000 1.000 0.950 1580
WB  TH-RT      1800  2 0.933 0.990 1.000 1.000 1.000 1.000 0.989 1.000 3289
NB  LT         1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 1.000 1655
NB  TH-RT      1800  1 0.933 0.990 0.995 1.000 1.000 1.000 0.960 1.000 1590
SB  TH-RT      1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
NB  92  15  1  175  478  175 1.00  1    2 0.00
CALCULATIONS
DIR Sop    Yo     Gu     Fs    Pl     Gq    Pt     Gf       El    Fm   Flt
NB 1800 0.001 14.905 0.874 1.000  0.095 0.000  0.000    1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s  v/s  g/C    c  v/c  CRITICAL
EB  LT-TH      770 3600 0.21 0.36 1291 0.60     *
EB  RT           6 1530 0.00 0.36  549 0.01
WB  LT         273 1580 0.17 0.28  447 0.61
WB  TH-RT      845 3289 0.26 0.28  930 0.91     *
NB  LT         175 1655 0.11 0.16  270 0.65
NB  TH-RT      478 1590 0.30 0.16  259 1.84     *
SB  TH-RT        2 1499 0.00 0.16  244 0.01

CYCLE= 92.0  LOST=18.0  SUM V/S CRIT= 0.77 TOTAL V/C= 0.96

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C     d1     c      d2   PF   Delay LOS Avg Q  95% Q
EB  LT-TH     0.60 0.36  92.0  18.29 1291     0.56 0.85   16.02  C  12.0
EB  RT        0.01 0.36  92.0  14.43  549     0.00 0.85   12.27  B   0.1
WB  LT        0.61 0.28  92.0  21.74  447     1.75 1.00   23.49  C   5.0
WB  TH-RT     0.91 0.28  92.0  24.21  930     9.07 0.85   28.29  D  14.7
NB  LT        0.65 0.16  92.0  27.39  270     3.74 0.85   26.46  D   3.7
NB  TH-RT     1.84 0.16  92.0  35.01  259 1028.76 0.85  904.20  F 125.1
SB  TH-RT     0.01 0.16  92.0  24.53  244     0.00 0.85   20.85  C   0.0

DIR Delay LOS
EB   15.99  C
WB   27.12  D
NB  668.56  F
SB   20.85  C
INTERSECTION DELAY =188.12 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  95.6 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  28.1 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is   7.5 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   7.5 secs green,   8.0 secs yellow + red clear
suggested timing phase 4 is  24.0 secs green,   5.0 secs yellow + red clear
```

CAPACITY ANALYSIS – NO-BUILD CONDITION

```
NCH PROGRAM VERSION DATE 4-29-1986
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:16:00
omas More Dr./Chestnut Hill Dr. - No-Build Cond. 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=tnbam      GEOMETRICS=tnbam
/: A- -B
     |
     C
NERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
ROACH: C: Chestnut Hill
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
ROACH         A: Chestnut Hi B: Thomas More C: Chestnut Hi
TS              0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


ROACH         A: Chestnut Hi B: Thomas More C: Chestnut Hi
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  307  174   10  249    0   99    0   26
F               0.95           0.89           0.85
T VOLUME        0  323  183   11  280    0  116    0   31
RCENT GRADE     0.00           0.00           0.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00          99.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           1.00           0.00
S CAR/HR        0             11            116    0   31


EP 1 RIGHT TURNS FROM     C:Chestnut Hill
NFLICTING FLOWS                      415
TICAL GAPS                           5.0
ACITY                                784
TUAL CAPACITY                        784


EP 2 LEFT TURNS FROM     B:Thomas More
NFLICTING FLOWS                      506
ITICAL GAPS                          4.5
ACITY                                817
ACITY USED                             1%
EDANCE FACTOR                       0.99
TUAL CAPACITY                        817
```

```
DATE:02-27-1992                 TIME:21:16:00
Thomas More Dr./Chestnut Hill Dr. - No-Build Cond. 1996 AM Peak Hour


STEP 3 LEFT TURNS FROM      C:Chestnut Hill
CONFLICTING FLOWS                      706
CRITICAL GAPS                          6.0
CAPACITY                               417
ACTUAL CAPACITY                        414


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                 11        817       805      A      4.47          0

ALL MOVES FROM C:         147        459       312      B     11.53          0
```

```
ICH PROGRAM VERSION DATE 4-29-1988
35 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:19:28
omas More Dr./Chestnut Hill Dr. - No-Build Peak Hour


ST DATASETS LOADED OR SAVED
LUME=tnbpm      GEOMETRICS=tnbpm
/: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Chestnut Hill
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  263  150   35  380    0   96    0   34
F               0.85           0.85           0.88
J VOLUME        0  309  176   41  447    0  109    0   39
RCENT GRADE     0.00           0.00           0.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00          99.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           1.00           0.00
SS CAR/HR       0             42            109    0   39


EP 1 RIGHT TURNS FROM     C:Chestnut Hill
NFLICTING FLOWS                      398
ITICAL GAPS                          5.0
PACITY                               799
TUAL CAPACITY                        799


EP 2 LEFT TURNS FROM     B:Thomas More
NFLICTING FLOWS                      486
ITICAL GAPS                          4.5
PACITY                               834
PACITY USED                            5%
PEDANCE FACTOR                      0.97
TUAL CAPACITY                        834
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES  PAGE 2 of 2
DATE:02-27-1992                   TIME:21:19:28
Thomas More Dr./Chestnut Hill Dr. - No-Build Peak Hour


STEP 3 LEFT TURNS FROM      C:Chestnut Hill
CONFLICTING FLOWS                       886
CRITICAL GAPS                           6.0
CAPACITY                                323
ACTUAL CAPACITY                         314


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                  42        834       792     A      4.55         0.

ALL MOVES FROM C:          148        374       226     C     15.93         0
```

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ICH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
TE:02-27-1992                TIME:21:05:04
acon St./Chestnut Hill Dr. & Rd. - No-Build Cond. 1996 AM Peak Hour


T DATASETS LOADED OR SAVED
LUME=bcnbam      GEOMETRICS=bcnbam
:     D
      |
   A-  -B
      |
      C
ERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
TROLS: FROM C: STOP
        FROM D: STOP
        FROM D RT LANE: STOP
VAILING SPEED:  30  MPH
N STREET # OF LANES: 2 LANES
N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
N STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

NOR STREET LANES

ROACH: C: Chest. Rd.
CLUSIVE LEFT TURN LANES: NO
CLUSIVE RIGHT TURN LANES: NO
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
HT TURN ACCELERATION LANE ON MAJOR: NO

ROACH: D: Chest. Dr.
CLUSIVE LEFT TURN LANES: NO
CLUSIVE RIGHT TURN LANES: YES
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
HT TURN ACCELERATION LANE ON MAJOR: NO

HT DISTANCE RESTRICTIONS (in seconds)
ROACH          A: Beacon EB    B: Beacon WB    C: Chest. Rd.   D: Chest. Dr.
TS                0.00            0.00            0.00            0.00
US                0.00            0.00            0.00            0.00
HTS               0.00            0.00            0.00            0.00


ROACH          A: Beacon EB    B: Beacon WB    C: Chest. Rd.   D: Chest. Dr.
                LT   TH    RT   LT    TH    RT   LT    TH    RT   LT    TH    RT
LUME           388  589    5    0   539    87    0     6     3   57     3   288
                 0.85            0.85            0.85            0.89
 VOLUME        456  693    6    0   634   102    0     7     4   64     3   324
RCENT GRADE      0.00            0.00           -3.00
RCENT CYCLES       0.00            0.00            0.00            0.00
SSENGER CARS      98.00           98.00          %100.00           99.00
RCENT LT TRU       0.00            0.00            0.00            0.00
RCENT HV TRU       2.00            2.00            0.00            1.00
SS CAR/HR      466              0                0     6     3   65     3   [illegible]


EP 1 RIGHT TURNS FROM      C:Chest. Rd.                D:Chest. Dr.
NFLICTING FLOWS                      696                    634
ITICAL GAPS                          5.0                    4.5
ACITY                                572                    718
PACITY USED                           1%                     46%
EDANCE FACTOR                       1.00                   0.62
UAL CAPACITY                         572                    718
```

```
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:02-27-1992             TIME:21:05:04
Beacon St./Chestnut Hill Dr. & Rd. - No-Build Cond. 1996 AM Peak Hour

STEP 2 LEFT TURNS FROM     B:Beacon WB              A:Beacon EB
CONFLICTING FLOWS                     699                  634
CRITICAL GAPS                         5.0                  5.0
CAPACITY                              570                  615
CAPACITY USED                          0%                  76%
IMPEDANCE FACTOR                     1.00                 0.30
ACTUAL CAPACITY                       570                  615


STEP 3 THRU MOVES FROM     C:Chest. Rd.             D:Chest. Dr.
CONFLICTING FLOWS                    1786                 1789
CRITICAL GAPS                         6.0                  6.0
CAPACITY                               75                   75
CAPACITY USED                          8%                   5%
IMPEDANCE FACTOR                     0.95                 0.98
ACTUAL CAPACITY                        23                   22


STEP 4 LEFT TURNS FROM     C:Chest. Rd.             D:Chest. Dr.
CONFLICTING FLOWS                    2113                 1800
CRITICAL GAPS                         6.5                  6.5
CAPACITY                               29                   56
ACTUAL CAPACITY                         5                   16


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM A:                466        615       149     D     24.17        3

ALL MOVES FROM C:           9         33        24     E    148.69        0

RT FROM D:                327        718       391     B      9.21        0
SHARED LT/TH FROM D:       68         16       -52     F   INFINITE     INFIN
```

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.CH PROGRAM VERSION DATE 4-27-1986
)5 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
,E:02-27-1992             TIME:21:12:38
:con St./Chestnut Hill Dr. & Rd. - No-Build Cond. 1996 PM Peak Hour


.T DATASETS LOADED OR SAVED
)UME=bcnbpm      GEOMETRICS=bcnbpm
:    D
     |
  A-  -B
     |
     C
ERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
TROLS: FROM C: STOP
       FROM D: STOP
       FROM D RT LANE: STOP
VAILING SPEED:  30  MPH
N STREET # OF LANES: 2 LANES
N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
N STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

OR STREET LANES

ROACH: C: Chest. Rd.
LUSIVE LEFT TURN LANES: NO
LUSIVE RIGHT TURN LANES: NO
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
HT TURN ACCELERATION LANE ON MAJOR: NO

ROACH: D: Chest. Dr.
LUSIVE LEFT TURN LANES: NO
LUSIVE RIGHT TURN LANES: YES
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
HT TURN ACCELERATION LANE ON MAJOR: NO

HT DISTANCE RESTRICTIONS (in seconds)
ROACH        A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
TS              0.00           0.00           0.00           0.00
US              0.00           0.00           0.00           0.00
HTS             0.00           0.00           0.00           0.00


ROACH        A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
              LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
UME          317  532    4    2  627   95    4    1    5   84    7  385
                0.85           0.89           0.85           0.85
 VOLUME      373  626    5    2  704  107    5    1    6   99    8  453
CENT GRADE      0.00           0.00          -3.00
CENT CYCLES       0.00           0.00           0.00           0.00
SENGER CARS      99.00          98.00        %100.00          99.00
CENT LT TRU       0.00           0.00           0.00           0.00
CENT HV TRU       1.00           2.00           0.00           1.00
S CAR/HR     377            2               4    1    5  100    8  457


P 1 RIGHT TURNS FROM      C:Chest. Rd.              D:Chest. Dr.
FLICTING FLOWS                       628                 704
TICAL GAPS                           5.0                 4.5
ACITY                                619                 667
ACITY USED                             1%                 69%
EDANCE FACTOR                       1.00                0.38
UAL CAPACITY                         619                 667
```

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1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:02-27-1992                 TIME:21:12:38
Beacon St./Chestnut Hill Dr. & Rd. - No-Build Cond. 1996 PM Peak Hour

STEP 2 LEFT TURNS FROM     B:Beacon WB               A:Beacon EB
CONFLICTING FLOWS                      631                      704
CRITICAL GAPS                          5.0                      5.0
CAPACITY                               617                      567
CAPACITY USED                            0%                      66%
IMPEDANCE FACTOR                      1.00                     0.40
ACTUAL CAPACITY                        617                      567


STEP 3 THRU MOVES FROM     C:Chest. Rd.              D:Chest. Dr.
CONFLICTING FLOWS                     1708                     1710
CRITICAL GAPS                          6.0                      6.0
CAPACITY                                87                       86
CAPACITY USED                            1%                      10%
IMPEDANCE FACTOR                      1.00                     0.94
ACTUAL CAPACITY                         35                       35


STEP 4 LEFT TURNS FROM     C:Chest. Rd.              D:Chest. Dr.
CONFLICTING FLOWS                     2169                     1717
CRITICAL GAPS                          6.5                      6.5
CAPACITY                                26                       65
ACTUAL CAPACITY                          4                       26


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM A:                 377        567       190    D      18.94        1
LT FROM B:                   2        617       615    A       5.86        0

ALL MOVES FROM C:           10          9        -1    F   INFINITE     INFIN

RT FROM D:                 457        667       209    C      17.19        2
SHARED LT/TH FROM D:       108         27       -82    F   INFINITE     INFIN
```

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NC- PROGRAM VERSION DATE 4-29-1988
35 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:48:21
acon St./BC Dr. - No-Build Cond. 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=gnbam      GEOMETRICS=gnbam
Y: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: BC Dr.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon WB   B: Beacon EB   C: BC Dr.
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Beacon WB   B: Beacon EB   C: BC Dr.
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  733   94  251  977    0    5    0   14
F               0.85           0.85           0.85
J VOLUME        0  862  111  295 1149    0    6    0   16
RCENT GRADE     0.00           0.00           1.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     98.00          98.00         %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      2.00           2.00           0.00
SS CAR/HR       0            301              6    0   18


EP 1 RIGHT TURNS FROM     C:BC Dr.
NFLICTING FLOWS                      918
ITICAL GAPS                          5.0
PACITY                               440
TUAL CAPACITY                        440


EP 2 LEFT TURNS FROM     B:Beacon EB
NFLICTING FLOWS                      973
ITICAL GAPS                          4.5
PACITY                               498
PACITY USED                           61%
PEDANCE FACTOR                      0.47
TUAL CAPACITY                        498
```

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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-2[illegible]-1992                TIME:21:48:21
Beacon St./BC Dr. - No-Build Cond. 1996 AM Peak Hour


STEP 3 LEFT TURNS FROM       C:BC Dr.
CONFLICTING FLOWS                        2362
CRITICAL GAPS                             6.0
CAPACITY                                   23
ACTUAL CAPACITY                            11


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                301         498       197     D     18.31          1

LT FROM C:                  6          11         4     E    880.89         73
RT FROM C:                 18         440       421     A      8.54          0
```

```
CH PROGRAM VERSION DATE 4-29-1988
5 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
E:02-27-1992             TIME:22:03:40
con St./BC Dr. - No-Build 1996 PM Peak Hour


T DATASETS LOADED OR SAVED
UME=gnbpm      GEOMETRICS=gnbpm
: A- -B
    |
    C
ERAL CHARACTERISTICS
ULATION GREATER THAN 250,000: YES
TROLS: FROM C: STOP
       FROM C RT LANE: STOP
VAILING SPEED:  30  MPH
N STREET # OF LANES: 2 LANES
N STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

OR STREET LANES
ROACH: C: BC Dr.
RED LEFT AND RIGHT TURN LANE: NO
GE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
HT TURN ACCELERATION LANE ON MAJOR: NO


HT DISTANCE RESTRICTIONS (in seconds)
ROACH        A: Beacon WB   B: Beacon EB   C: BC Dr.
TS             0.00           0.00           0.00
US             0.00           0.00           0.00
HTS            0.00           0.00           0.00


ROACH        A: Beacon WB   B: Beacon EB   C: BC Dr.
              LT   TH   RT   LT   TH   RT   LT   TH   RT
UME            0  961   55   93  782    0   71    0  162
               0.89           0.85           0.85
 VOLUME        0 1080   62  109  920    0   84    0  191
CENT GRADE     0.00           0.00           1.00
CENT CYCLES      0.00           0.00           0.00
SENGER CARS     98.00          99.00          %100.00
CENT LT TRU      0.00           0.00           0.00
CENT HV TRU      2.00           1.00           0.00
S CAR/HR       0            111             92    0  210


P 1 RIGHT TURNS FROM     C:BC Dr.
FLICTING FLOWS                     1111
TICAL GAPS                          5.0
ACITY                               345
UAL CAPACITY                        345


P 2 LEFT TURNS FROM     B:Beacon EB
FLICTING FLOWS                     1142
TICAL GAPS                          4.5
ACITY                               410
ACITY USED                           27%
EDANCE FACTOR                      0.80
UAL CAPACITY                        410
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992            TIME:22:03:40
Beacon St./BC Dr. - No-Build 1996 PM Peak Hour


STEP 3 LEFT TURNS FROM     C:BC Dr.
CONFLICTING FLOWS                     2140
CRITICAL GAPS                          6.0
CAPACITY                                37
ACTUAL CAPACITY                         30


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT               DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:               111        410       299     C     12.04          0

LT FROM C:                92         30       -62     F   INFINITE    INFIN
RT FROM C:               210        345       135     D     26.62          0
```

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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
ATE:02-27-1992              TIME:21:29:29
acon St./Reservoir Ave. - No-Build Cond. 1992 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=rnbam       GEOMETRICS=rnbam
Y: A- -B
      |
      C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Reservoir St.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH          A: Beacon St.   B: Beacon St.   C: Reservoir S
FTS               0.00            0.00            0.00
RUS               0.00            0.00            0.00
GHTS              0.00            0.00            0.00


PROACH          A: Beacon St.   B: Beacon St.   C: Reservoir S
                 LT    TH    RT   LT    TH    RT   LT    TH    RT
LUME              0 1007     0     0   747     0   13     0   221
F                 0.85            0.85            0.85
J VOLUME          0 1185     0     0   879     0   15     0   260
RCENT GRADE       0.00            0.00           -2.00
RCENT CYCLES        0.00            0.00            0.00
SSENGER CARS       98.00           98.00          %100.00
RCENT LT TRU        0.00            0.00            0.00
RCENT HV TRU        2.00            2.00            0.00
SS CAR/HR         0               0               14     0   234


EP 1 RIGHT TURNS FROM     C:Reservoir St.
NFLICTING FLOWS                     1185
ITICAL GAPS                          5.0
PACITY                               313
TUAL CAPACITY                        313


EP 2 LEFT TURNS FROM     B:Beacon St. WB
NFLICTING FLOWS                     1185
ITICAL GAPS                          4.5
PACITY                               389
PACITY USED                            0%
PEDANCE FACTOR                      1.00
TUAL CAPACITY                        389
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:01-2[illegible]-1992                TIME:21:29:29
Beaon St./Reservoir Ave. - No-Build Cond. 1992 AM Peak Hour


STEP 3 LEFT TURNS FROM        C:Reservoir St.
CONFLICTING FLOWS                       2064
CRITICAL GAPS                            6.0
CAPACITY                                  44
ACTUAL CAPACITY                           44


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                    DEMAND     CAPACITY  RESERVE    LOS  AVG DEL(SEC)  AVG


LT FROM C:                    14          44         30      E     119.34          0.
RT FROM C:                   234         313         79      E      45.47          0.
```

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NCH PROGRAM VERSION DATE 4-27-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992              TIME:21:36:52
acon St./Reservoir Ave. - No-Build Cond. 1996 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=rnbpm      GEOMETRICS=rnbpm
Y: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Reservoir St.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon St.  B: Beacon St.  C: Reservoir S
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Beacon St.  B: Beacon St.  C: Reservoir S
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  779    0    0 1123    0   20    0   96
F               0.85           0.89           0.85
J VOLUME        0  916    0    0 1262    0   24    0  113
RCENT GRADE     0.00           0.00          -2.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00          98.00         %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           2.00           0.00
SS CAR/HR       0              0              21    0  102


EP 1 RIGHT TURNS FROM     C:Reservoir St.
NFLICTING FLOWS                      916
ITICAL GAPS                          5.0
PACITY                               440
TUAL CAPACITY                        440


EP 2 LEFT TURNS FROM     B:Beacon St. WB
NFLICTING FLOWS                      916
ITICAL GAPS                          4.5
PACITY                               530
PACITY USED                            0%
PEDANCE FACTOR                      1.00
TUAL CAPACITY                        530
```

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1985 HCM: CHAPTER 10 : UNSIGNALIZED   T APPROACHES (PAGE 2 of 2)
DATE:02-27-1992              TIME:21:36:52
Beacon St./Reservoir Ave. - No-Build Cond. 1996 PM Peak Hour


STEP 3 LEFT TURNS FROM       C:Reservoir St.
CONFLICTING FLOWS                      2178
CRITICAL GAPS                           6.0
CAPACITY                                 34
ACTUAL CAPACITY                          34


                      SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG


LT FROM C:                 21         34        13      E    270.42          0
RT FROM C:                102        440       339      B     10.63          0
```

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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992              TIME:20:56:14
mmonwealth Ave./Fr. Herlihy Terr - No-Build 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=hnbam        GEOMETRICS=hnbam
Y: A- -B
      |
      C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 4 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Fr. Herl.
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH          A: Comm. EB     B: Comm. WB     C: Fr. Herl.
FTS                0.00            0.00            0.00
RUS                0.00            0.00            0.00
GHTS               0.00            0.00            0.00


PROACH          A: Comm. EB     B: Comm. WB     C: Fr. Herl.
                  LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME               0  894  240   31  612    0    0    0    1
F                  0.85            0.85            0.85
J VOLUME           0 1052  282   36  720    0    0    0    1
RCENT GRADE     -1.00           0.00            1.00
RCENT CYCLES         0.00            0.00            0.00
SSENGER CARS        98.00           96.00           %100.00
RCENT LT TRU         0.00            0.00            0.00
RCENT HV TRU         2.00            4.00            0.00
SS CAR/HR          0              38              0    0    1


EP 1 RIGHT TURNS FROM      C:Fr. Herl.
NFLICTING FLOWS                       667
ITICAL GAPS                           5.0
PACITY                                592
TUAL CAPACITY                         592


EP 2 LEFT TURNS FROM      B:Comm. WB
NFLICTING FLOWS                      1334
ITICAL GAPS                           5.0
PACITY                                256
PACITY USED                            15%
PEDANCE FACTOR                       0.90
TUAL CAPACITY                         256
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992              TIME:20:56:14
Commonwealth Ave./Fr. Herlihy Terr. - No-Build 1996 AM Peak Hour


STEP 3 LEFT TURNS FROM      C:Fr. Herl.
CONFLICTING FLOWS                      1949
CRITICAL GAPS                           6.5
CAPACITY                                 41
ACTUAL CAPACITY                          37


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                38        256       218      C      16.49          0

ALL MOVES FROM C:          1        592       591      A       6.10          0.
```

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NCH PROGRAM VERSION DATE 4-29-1988
35 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:08:06:58
mmonwealth Ave./Fr. Herlihy Terr - No-Build Cond. 1996 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=hnbpm      GEOMETRICS=hnbpm
Y: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 4 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Fr. Herl.
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Comm. EB    B: Comm. WB    C: Fr. Herl.
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Comm. EB    B: Comm. WB    C: Fr. Herl.
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  670  154   21  841    0    0    0    1
F               0.88           0.91           0.80
J VOLUME        0  761  175   23  924    0    0    0    1
RCENT GRADE    -1.00           0.00           1.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00    .     98.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           2.00           0.00
SS CAR/HR       0             24              0    0    1


EP 1 RIGHT TURNS FROM     C:Fr. Herl.
NFLICTING FLOWS                      468
ITICAL GAPS                          5.0
PACITY                               740
TUAL CAPACITY                        740


EP 2 LEFT TURNS FROM     B:Comm. WB
NFLICTING FLOWS                      936
ITICAL GAPS                          5.0
PACITY                               430
PACITY USED                            5%
PEDANCE FACTOR                      0.97
TUAL CAPACITY                        430
```

```
1985 HCM - CHAPTER 10 : UNSIGNALIZED - T APPROACHES   PAGE 2 of 2
DATE:02-27-1992             TIME:08:06:58
Commonwealth Ave./Fr. Herlihy Terr. - No-Build Cond. 1996 PM Peak Hour


STEP 3 LEFT TURNS FROM       C:Fr. Herl.
CONFLICTING FLOWS                     1796
CRITICAL GAPS                          6.5
CAPACITY                                56
ACTUAL CAPACITY                         54


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                  DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG (

LT FROM B:                  24         430       406     A       8.87         0.

ALL MOVES FROM C:            1         740       738     A       4.88         0.
```

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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
-Build Cond. 1996 AM Peak Hour
te:02-27-1992             time:20:31:02
ST DATA SET NAMES LOADED OR SAVED
LUME=lnbam      GEOMETRICS=lnbam      SIGNAL=lnban
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES      # OF LANES     LANE WIDTH     CROSS
R  LT   TH   RT    LT TH RT     LT   TH   RT     WALK
  381  512   13     0  2  1     0.0 12.0 12.0     0
  310  572   52     1  2  0    10.0 10.0  0.0     0
   71  205   50     1  1  0    10.0 10.0  0.0     0
    0    1    1     0  1  0     0.0 12.0  0.0     0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK                    PEDESTRIANS        ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
 -1:0%  2.0%   N      0     0   .850    0   n     7.0    3
  0.0%  4.0%   N      0     0   .850    0   n     7.0    3
  1.0%  3.0%   N      0     0   .850    0   n     7.0    3
  0.0%  0.0%   N      0     0   .900    0   n     7.0    3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
                          *  *  *     *  *  *     17.0   5     A
  *  *  *                                         30.0   5     A
     *  *                                         11.0   8     A
              *  *  *                             21.0   5     A

CLE= 102.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R   LTV  THV  RTV   PHF  LTFR THFR RTFR
    381  512   13  .850   448  602   15
    310  572   52  .850   365  673   61
     71  205   50  .850    84  241   59
      0    1    1  .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP  FLOW N   LU    v  Plt  Prt
```

```
EB   RT            15 1 1.00    15 0.00 1.00
WB   LT           365 1 1.00   365 1.00 0.00
WB   TH-RT        734 2 1.05   771 0.00 0.08
NB   LT            84 1 1.00    84 1.00 0.00
NB   TH-RT        300 1 1.00   300 0.00 0.20
SB   TH-RT          2 1 1.00     2 0.00 0.50

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                 OPPOSING APPROACH
BEING OPPOSED        VOLUMES        % OPPOSING LEFT TURN      # LANES       OPPOSI
                   LT    TH    RT        LT    TH    RT        LT  TH  RT     VOLUM
EASTBOUND         365   673    61         0     0     0         1   2   0         0
WESTBOUND         448   602    15         0     0     0         0   2   1         0
NORTHBOUND          0     1     1       100   100   100         0   1   0         2

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP   IDEAL N  Fwid   Fhv    Fgr  Fpark  Fbus Farea   Frt    Flt     s
EB  LT-TH      1800  2 1.000 0.990 1.005 1.000 1.000 1.000 1.000 1.000 3582
EB  RT         1800  1 1.000 0.990 1.005 1.000 1.000 1.000 0.850 1.000 1522
WB  LT         1800  1 0.933 0.980 1.000 1.000 1.000 1.000 1.000 0.950 1565
WB  TH-RT      1800  2 0.933 0.980 1.000 1.000 1.000 1.000 0.987 1.000 3253
NB  LT         1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB  TH-RT      1800  1 0.933 0.985 0.995 1.000 1.000 1.000 0.971 1.000 1598
SB  TH-RT      1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N    Va    Vm   Vlt   Plt  No    Vo Plto
NB 102   17   1    84   300    84 1.00   1     2 0.00
CALCULATIONS
DIR Sop     Yo     Gu     Fs     Pl      Gq     Pt      Gf         El     Fm    Flt
NB 1800 0.001 16.895 0.874 1.000  0.105 0.000  0.000     1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s   v/s  g/C     c   v/c  CRITICAL
EB  LT-TH      1103 3582 0.31 0.45 1615 0.68      *
EB  RT           15 1522 0.01 0.45  687 0.02
WB  LT          365 1565 0.23 0.21  322 1.13
WB  TH-RT       771 3253 0.24 0.21  670 1.15      *
NB  LT           84 1647 0.05 0.17  274 0.30
NB  TH-RT       300 1598 0.19 0.17  266 1.13      *
SB  TH-RT         2 1499 0.00 0.17  250 0.01

CYCLE=102.0  LOST=18.0  SUM V/S CRIT= 0.73 TOTAL V/C= 0.89

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c      d2    PF    Delay LOS Avg Q  95%
EB  LT-TH     0.68 0.45 102.0  16.88 1615    0.85 0.85   15.07  C   16.3
EB  RT        0.02 0.45 102.0  11.80  687    0.00 0.85   10.03  B    0.2
WB  LT        1.13 0.21 102.0  31.87  322   89.48 1.00  121.35  F   16.4
WB  TH-RT     1.15 0.21 102.0  32.03  670   85.99 0.85  100.32  F   28.7
NB  LT        0.30 0.17 102.0  28.35  274    0.20 0.85   24.27  C    2.0
NB  TH-RT     1.13 0.17 102.0  33.14  266   91.06 0.85  105.57  F   12.3
SB  TH-RT     0.01 0.17 102.0  26.96  250    0.00 0.85   22.91  C    0.1

DIR Delay  LOS
EB   15.00  B
WB  107.07  F
NB   87.86  F
SB   22.91  C
INTERSECTION DELAY = 65.20 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS
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CM PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
-Build Cond. 1996 PM Peak Hour
e:02-27-1992                time:20:43:09
ST DATA SET NAMES LOADED OR SAVED
LUME=1nbpm        GEOMETRICS=1nbpm        SIGNAL=1nbpm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES        # OF LANES       LANE WIDTH      CROSS
R   LT    TH    RT    LT TH RT       LT    TH    RT    WALK
   252   419     5     0  2  1       0.0 12.0 12.0      0
   281   705    57     1  2  0      10.0 10.0  0.0      0
   157   313   113     1  1  0      10.0 10.0  0.0      0
     0     1     1     0  1  0       0.0 12.0  0.0      0

AFFIC & ROADWAY CONDITIONS
                ADJ PARK                  PEDESTRIANS          ARR
R GRADE %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
 -1.0%  1.0%   N     0     0   .880   0    n     7.0     3
  0.0%  2.0%   N     0     0   .910   0    n     7.0     3
  1.0%  2.0%   N     0     0   .850   0    n     7.0     3
  0.0%  0.0%   N     0     0   .900   0    n     7.0     3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
                          *  *  *     *  *  *     15.0   5    A
  *  *  *                                         19.0   5    A
     *  *                                         11.0   8    A
              *  *  *                             26.0   5    A

CLE=  94.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   252  419    5  .880   286  476    6
   281  705   57  .910   309  775   63
   157  313  113  .850   185  368  133
     0    1    1  .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N   LU    v   Plt  Prt
  LT-TH       763 2 1.05  801 0.38 0.00
  RT            6 1 1.00    6 0.00 1.00
  LT          309 1 1.00  309 1.00 0.00
  TH-RT       837 2 1.05  879 0.00 0.07
  LT          185 1 1.00  185 1.00 0.00
  TH-RT       501 1 1.00  501 0.00 0.27
  TH-RT         2 1 1.00    2 0.00 0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                OPPOSING APPROACH
ING OPPOSED        VOLUMES        % OPPOSING LEFT TURN     # LANES      OPPOSING
                LT    TH    RT      LT    TH    RT       LT  TH  RT     VOLUME
STBOUND        309   775    63       0     0     0        1   2   0        0
STBOUND        286   476     6       0     0     0        0   2   1        0
RTHBOUND         0     1     1     100   100   100        0   1   0        2

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt     s
  LT-TH      1800  2 1.000 0.995 1.005 1.000 1.000 1.000 1.000 1.000 3600
  RT         1800  1 1.000 0.995 1.005 1.000 1.000 1.000 0.850 1.000 1530
  LT         1800  1 0.933 0.990 1.000 1.000 1.000 1.000 1.000 0.950 1580
```

```
WB   TH-RT        1800   2 0.933 0.990 1.000 1.000 1.000 1.000 0.989 1.000 3289
NB   LT           1800   1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 1.000 1655
NB   TH-RT        1800   1 0.933 0.990 0.995 1.000 1.000 1.000 0.960 1.000 1589
SB   TH-RT        1800   1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N    Va    Vm    Vlt  Plt  No    Vo Plto
NB   94   15   1   185   501   185 1.00  1     2 0.00
CALCULATIONS
DIR Sop    Yo      Gu     Fs      Pl       Gq     Pt      Gf        El     Fm    Flt
NB 1800 0.001 14.902 0.874 1.000  0.098 0.000  0.000     1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP      v     s   v/s  g/C    c   v/c  CRITICAL
EB   LT-TH      801 3600 0.22 0.37 1340 0.60      *
EB   RT           6 1530 0.00 0.37  570 0.01
WB   LT         309 1580 0.20 0.28  437 0.71
WB   TH-RT      879 3289 0.27 0.28  910 0.97      *
NB   LT         185 1655 0.11 0.16  264 0.70
NB   TH-RT      501 1589 0.32 0.16  254 1.98      *
SB   TH-RT        2 1499 0.00 0.16  239 0.01

CYCLE= 94.0  LOST=18.0  SUM V/S CRIT= 0.81 TOTAL V/C= 1.00

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1    c       d2    PF   Delay LOS Avg Q  95%
EB   LT-TH    0.60 0.37  94.0  18.10 1340     0.54 0.85   15.84  C  12.5
EB   RT       0.01 0.37  94.0  14.12  570     0.00 0.85   12.01  B   0.1
WB   LT       0.71 0.28  94.0  23.23  437     3.56 1.00   26.79  D   5.8
WB   TH-RT    0.97 0.28  94.0  25.51  910    16.32 0.85   35.55  D  16.2
NB   LT       0.70 0.16  94.0  28.40  264     5.39 0.85   28.72  D   4.1
NB   TH-RT    1.98 0.16  94.0  36.85  254 1361.15 0.85 1188.30  F 170.9
SB   TH-RT    0.01 0.16  94.0  25.27  239     0.00 0.85   21.48  C   0.0

DIR Delay LOS
EB   15.81  C
WB   33.28  D
NB 876.03   F
SB   21.48  C
INTERSECTION DELAY =243.50 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 118.0 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  28.2 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is   7.4 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   7.4 secs green,   8.0 secs yellow + red clear
suggested timing phase 4 is  23.9 secs green,   5.0 secs yellow + red clear
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CAPACITY ANALYSIS – BUILD CONDITION

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NCH PROGRAM VERSION DATE 4-29-1988
35 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:17:08
omas More Dr./Chestnut Hill Dr. - Build Cond. 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=tbam       GEOMETRICS=tbam
Y: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Chestnut Hill
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
EFTS            0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
               LT  TH    RT   LT   TH   RT   LT   TH   RT
LUME            0  297  174    9  252    0   99    0   23
F               0.95           0.89           0.85
J VOLUME        0  313  183   10  283    0  116    0   27
RCENT GRADE     0.00           0.00           0.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00          99.00         %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           1.00           0.00
SS CAR/HR       0             10             116    0   27


EP 1 RIGHT TURNS FROM     C:Chestnut Hill
NFLICTING FLOWS                      404
ITICAL GAPS                          5.0
PACITY                               793
TUAL CAPACITY                        793


EP 2 LEFT TURNS FROM     B:Thomas More
NFLICTING FLOWS                      496
ITICAL GAPS                          4.5
PACITY                               825
PACITY USED                            1%
PEDANCE FACTOR                      1.00
TUAL CAPACITY                        825
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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACH      PAGE 2 OF 2
DATE:02-27-1992                    TIME:21:17:08
Thomas More Dr./Chestnut Hill Dr. - Build Cond. 1996 AM Peak Hour


STEP 3 LEFT TURNS FROM      C:Chestnut Hill
CONFLICTING FLOWS                       697
CRITICAL GAPS                           6.0
CAPACITY                                421
ACTUAL CAPACITY                         419


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG (

LT FROM B:                 10         825       815     A      4.42           0.

ALL MOVES FROM C:         144         460       317     B     11.37           0.
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NCH PROGRAM VERSION DATE 4-29-1988
35 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:21:23
omas More Dr./Chestnut Hill Dr. - Build 1996 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=tbpm       GEOMETRICS=tbpm
Y: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Chestnut Hill
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Chestnut Hi B: Thomas More C: Chestnut Hi
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  332  150   33  390    0  100    0   48
F               0.85           0.85           0.88
J VOLUME        0  391  176   39  459    0  114    0   55
RCENT GRADE     0.00           0.00           0.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00          99.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           1.00           0.00
SS CAR/HR       0             39            114    0   55


EP 1 RIGHT TURNS FROM     C:Chestnut Hill
NFLICTING FLOWS                      479
ITICAL GAPS                          5.0
PACITY                               731
TUAL CAPACITY                        731


EP 2 LEFT TURNS FROM     B:Thomas More
NFLICTING FLOWS                      567
ITICAL GAPS                          4.5
PACITY                               768
PACITY USED                            5%
PEDANCE FACTOR                      0.97
TUAL CAPACITY                        768
```

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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES  PAGE 2 OF 2
DATE:02-27-1992              TIME:21:21:23
Thomas More Dr./Chestnut Hill Dr. - Build 1996 PM Peak Hour


STEP 3 LEFT TURNS FROM      C:Chestnut Hill
CONFLICTING FLOWS                       976
CRITICAL GAPS                           6.0
CAPACITY                                283
ACTUAL CAPACITY                         275


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                 39        768       729      A      4.94         0

ALL MOVES FROM C:         168        345       177      D     20.34         0
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HCM PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
TE:02-27-1992             TIME:21:07:53
acon St./Chestnut Hill Dr. & Rd. -- Build Cond. 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=bcbam      GEOMETRICS=bcbam
Y:   D
     |
   A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM D: STOP
        FROM D RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
IN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

NOR STREET LANES

PROACH: C: Chest. Rd.
CLUSIVE LEFT TURN LANES: NO
CLUSIVE RIGHT TURN LANES: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO

PROACH: D: Chest. Dr.
CLUSIVE LEFT TURN LANES: NO
CLUSIVE RIGHT TURN LANES: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
GHT TURN ACCELERATION LANE ON MAJOR: NO

GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
FTS             0.00           0.00           0.00           0.00
RUS             0.00           0.00           0.00           0.00
GHTS            0.00           0.00           0.00           0.00


PROACH        A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
               LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME          388  589    5    0  530   77    0    6    3   59    3  289
F               0.85           0.85           0.85           0.89
J VOLUME      456  693    6    0  624   91    0    7    4   66    3  325
RCENT GRADE     0.00           0.00          -3.00
RCENT CYCLES      0.00           0.00           0.00           0.00
SSENGER CARS     98.00          98.00          %100.00          99.00
RCENT LT TRU      0.00           0.00           0.00           0.00
RCENT HV TRU      2.00           2.00           0.00           1.00
SS CAR/HR     466              0              0    6    3   67    3  328


EP 1 RIGHT TURNS FROM     C:Chest. Rd.             D:Chest. Dr.
NFLICTING FLOWS                      696                  624
ITICAL GAPS                          5.0                  4.5
PACITY                               572                  725
PACITY USED                            1%                  45%
PEDANCE FACTOR                      1.00                0.62
TUAL CAPACITY                        572                  725
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1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:02-27-1992             TIME:21:07:53
Beacon St./Chestnut Hill Dr. & Rd. - Build Cond. 1996 AM Peak Hour

STEP 2 LEFT TURNS FROM     B:Beacon WB              A:Beacon EB
CONFLICTING FLOWS                      699                    624
CRITICAL GAPS                          5.0                    5.0
CAPACITY                               570                    622
CAPACITY USED                           0%                     75%
IMPEDANCE FACTOR                      1.00                   0.31
ACTUAL CAPACITY                        570                    622


STEP 3 THRU MOVES FROM     C:Chest. Rd.             D:Chest. Dr.
CONFLICTING FLOWS                     1776                   1779
CRITICAL GAPS                          6.0                    6.0
CAPACITY                                77                     76
CAPACITY USED                           8%                     4%
IMPEDANCE FACTOR                      0.95                   0.98
ACTUAL CAPACITY                         24                     24


STEP 4 LEFT TURNS FROM     C:Chest. Rd.             D:Chest. Dr.
CONFLICTING FLOWS                     2104                   1789
CRITICAL GAPS                          6.5                    6.5
CAPACITY                                30                     57
ACTUAL CAPACITY                          6                     17


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM A:                 466        622       156     D     23.01         2.

ALL MOVES FROM C:            9         35        26     E    138.64         0.

RT FROM D:                 328        725       397     B      9.06         0.
SHARED LT/TH FROM D:        70         17       -53     F   INFINITE     INFINI
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NCH PROGRAM VERSION DATE 4-29-1988
95 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
TE:03-01-1992             TIME:13:25:21
acon St./Chestnut Hill Dr. & Rd. - Build Cond. 1996 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=bcbpm      GEOMETRICS=bcbpm
Y:    D
      |
   A-   -B
      |
      C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM D: STOP
        FROM D RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
IN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

NOR STREET LANES

PROACH: C: Chest. Rd.
CLUSIVE LEFT TURN LANES: NO
CLUSIVE RIGHT TURN LANES: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO

PROACH: D: Chest. Dr.
CLUSIVE LEFT TURN LANES: NO
CLUSIVE RIGHT TURN LANES: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
GHT TURN ACCELERATION LANE ON MAJOR: NO

GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
FTS             0.00           0.00           0.00           0.00
RUS             0.00           0.00           0.00           0.00
GHTS            0.00           0.00           0.00           0.00


PROACH        A: Beacon EB   B: Beacon WB   C: Chest. Rd.  D: Chest. Dr.
               LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME          371  532    4    2  631  110    4    1    5   76    7  407
F               0.85           0.89           0.85           0.80
J VOLUME      436  626    5    2  709  124    5    1    6   95    9  509
RCENT GRADE     0.00           0.00          -3.00
RCENT CYCLES      0.00           0.00           0.00           0.00
SSENGER CARS     99.00          98.00          %100.00          99.00
RCENT LT TRU      0.00           0.00           0.00           0.00
RCENT HV TRU      1.00           2.00           0.00           1.00
SS CAR/HR     441              2              4    1    5   96    9  514


EP 1 RIGHT TURNS FROM     C:Chest. Rd.             D:Chest. Dr.
NFLICTING FLOWS                      628                 709
ITICAL GAPS                          5.0                 4.5
PACITY                               619                 664
PACITY USED                            1%                 77%
PEDANCE FACTOR                      1.00                0.28
TUAL CAPACITY                        619                 664
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1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-01-1992              TIME:13:25:21
Beacon St./Chestnut Hill Dr. & Rd. - Build Cond. 1996 PM Peak Hour

STEP 2 LEFT TURNS FROM     B:Beacon WB               A:Beacon EB
CONFLICTING FLOWS                      631                 709
CRITICAL GAPS                          5.0                 5.0
CAPACITY                               617                 564
CAPACITY USED                           0%                 78%
IMPEDANCE FACTOR                      1.00                0.27
ACTUAL CAPACITY                        617                 564


STEP 3 THRU MOVES FROM     C:Chest. Rd.              D:Chest. Dr.
CONFLICTING FLOWS                     1776                1778
CRITICAL GAPS                          6.0                 6.0
CAPACITY                                77                  76
CAPACITY USED                           1%                 12%
IMPEDANCE FACTOR                      0.99                0.93
ACTUAL CAPACITY                         21                  21


STEP 4 LEFT TURNS FROM     C:Chest. Rd.              D:Chest. Dr.
CONFLICTING FLOWS                     2293                1785
CRITICAL GAPS                          6.5                 6.5
CAPACITY                                19                  57
ACTUAL CAPACITY                          1                  16


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT               DEMAND    CAPACITY   RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM A:                441         564       123     D     29.28        3
LT FROM B:                  2         617       615     A      5.86        0

ALL MOVES FROM C:          10           3        -7     F   INFINITE    INFIN

RT FROM D:                514         664       150     D     24.02        3
SHARED LT/TH FROM D:      105          16       -89     F   INFINITE    INFIN
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NCH PROGRAM VERSION DATE 4-19-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992             TIME:21:58:43
acon St./BC Dr. - Build Cond. 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=gbam       GEOMETRICS=gbam
Y: A- -B
     |
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: BC Dr.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon WB    B: Beacon EB   C: BC Dr.
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Beacon WB    B: Beacon EB   C: BC Dr.
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  734   85  253  977    0    5    0   14
F               0.85           0.85           0.85
J VOLUME        0  864  100  298 1149    0    6    0   16
RCENT GRADE     0.00           0.00           1.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     98.00          98.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      2.00           2.00           0.00
SS CAR/HR       0            304              6    0   18


EP 1 RIGHT TURNS FROM     C:BC Dr.
NFLICTING FLOWS                      914
ITICAL GAPS                          5.0
PACITY                               442
TUAL CAPACITY                        442


EP 2 LEFT TURNS FROM     B:Beacon EB
NFLICTING FLOWS                      964
ITICAL GAPS                          4.5
PACITY                               503
PACITY USED                           60%
PEDANCE FACTOR                      0.47
TUAL CAPACITY                        503
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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992              TIME:21:58:43
Beacon St./BC Dr. - Build Cond. 1996 AM Peak Hour


STEP 3 LEFT TURNS FROM      C:BC Dr.
CONFLICTING FLOWS                         2361
CRITICAL GAPS                              6.0
CAPACITY                                    23
ACTUAL CAPACITY                             11


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                 304        503       199     D     18.05          1

LT FROM C:                   6         11         4     E    863.07         72
RT FROM C:                  18        442       424     A      8.50          0
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992              TIME:22:05:21
acon St./BC Dr. - Build Cond. 1996 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=gbpm       GEOMETRICS=gbpm
Y: A- -B
     :
     C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: BC Dr.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon WB   B: Beacon EB   C: BC Dr.
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Beacon WB   B: Beacon EB   C: BC Dr.
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  964   78  110  836    0   66    0  154
F               0.89           0.85           0.85
T VOLUME        0 1083   88  129  984    0   78    0  181
RCENT GRADE     0.00           0.00           1.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     98.00          99.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      2.00           1.00           0.00
SS CAR/HR       0            131             85    0  199


EP 1 RIGHT TURNS FROM     C:BC Dr.
NFLICTING FLOWS                     1127
ITICAL GAPS                          5.0
PACITY                               338
TUAL CAPACITY                        338


EP 2 LEFT TURNS FROM     B:Beacon EB
NFLICTING FLOWS                     1171
ITICAL GAPS                          4.5
PACITY                               396
PACITY USED                          33%
PEDANCE FACTOR                      0.74
TUAL CAPACITY                        396
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1985 HCM - CHAPTER 10 : UNSIGNALIZED - T APPROACHES (PAGE 2 of 2)
DATE:02-27-1992                TIME:22:05:21
Beacon St./BC Dr. - Build Cond. 1996 PM Peak Hour


STEP 3 LEFT TURNS FROM      C:BC Dr.
CONFLICTING FLOWS                       2240
CRITICAL GAPS                            6.0
CAPACITY                                  30
ACTUAL CAPACITY                           22


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                 131        396       265     C      13.59         0.

LT FROM C:                  85         22       -63     F   INFINITE     INFINI
RT FROM C:                 199        338       138     D      26.01         0.
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992                  TIME:21:31:33
acon St./Reservoir Ave. - Build Cond. 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=rbam          GEOMETRICS=rbam
Y: A- -B
      |
      C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Reservoir St.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon St.  B: Beacon St.  C: Reservoir S
FTS               0.00           0.00           0.00
RUS               0.00           0.00           0.00
GHTS              0.00           0.00           0.00


PROACH        A: Beacon St.  B: Beacon St.  C: Reservoir S
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0 1009    0    0  746    0   13    0  221
F                 0.85           0.85           0.85
 VOLUME         0 1187    0    0  878    0   15    0  260
RCENT GRADE       0.00           0.00          -2.00
RCENT CYCLES        0.00           0.00           0.00
SSENGER CARS       98.00          98.00         %100.00
RCENT LT TRU        0.00           0.00           0.00
RCENT HV TRU        2.00           2.00           0.00
SS CAR/HR       0              0              14    0  234


EP 1 RIGHT TURNS FROM     C:Reservoir St.
NFLICTING FLOWS                    1187
ITICAL GAPS                         5.0
PACITY                              312
TUAL CAPACITY                       312


EP 2 LEFT TURNS FROM     B:Beacon St. WB
NFLICTING FLOWS                    1187
ITICAL GAPS                         4.5
PACITY                              388
PACITY USED                          0%
PEDANCE FACTOR                     1.00
TUAL CAPACITY                       388
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[illegible] PAGE 2 OF [illegible]
DATE:[illegible]                      TIME:21:31:[illegible]
Beacon St./Reservoir Ave.  - Build Cond. 1996 AM Peak Hour


STEP 3 LEFT TURNS FROM       C:Reservoir St.
CONFLICTING FLOWS                       2065
CRITICAL GAPS                            6.0
CAPACITY                                  44
ACTUAL CAPACITY                           44


                    SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                     DEMAND     CAPACITY  RESERVE    LOS  AVG DEL(SEC) AVG


LT FROM C:                    14          44          30       E    119.76          0
RT FROM C:                   234         312          78       E     46.03          0
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:02-27-1992              TIME:21:41:15
acon St./Reservoir Ave. - Build Cond. 1996 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=rbpm        GEOMETRICS=rbpm
Y: A- -B
      |
      C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
        FROM C RT LANE: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 2 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Reservoir St.
ARED LEFT AND RIGHT TURN LANE: NO
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH        A: Beacon St.   B: Beacon St.  C: Reservoir S
FTS             0.00           0.00           0.00
RUS             0.00           0.00           0.00
GHTS            0.00           0.00           0.00


PROACH        A: Beacon St.   B: Beacon St.  C: Reservoir S
               LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME            0  848    0    0 1118    0   20    0   98
F               0.85           0.89           0.85
J VOLUME        0  998    0    0 1256    0   24    0  115
RCENT GRADE     0.00           0.00          -2.00
RCENT CYCLES      0.00           0.00           0.00
SSENGER CARS     99.00          98.00          %100.00
RCENT LT TRU      0.00           0.00           0.00
RCENT HV TRU      1.00           2.00           0.00
SS CAR/HR       0              0             21    0  104


EP 1 RIGHT TURNS FROM     C:Reservoir St.
NFLICTING FLOWS                       998
ITICAL GAPS                           5.0
PACITY                                398
TUAL CAPACITY                         398


EP 2 LEFT TURNS FROM     B:Beacon St. WB
NFLICTING FLOWS                       998
ITICAL GAPS                           4.5
PACITY                                484
PACITY USED                            0%
PEDANCE FACTOR                       1.00
TUAL CAPACITY                         484
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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:02-27-1992               TIME:21:41:15
Beacon St./Reservoir Ave. - Build Cond. 1996 PM Peak Hour


STEP 3 LEFT TURNS FROM       C:Reservoir St.
CONFLICTING FLOWS                       2254
CRITICAL GAPS                            6.0
CAPACITY                                  29
ACTUAL CAPACITY                           29


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG


LT FROM C:                 21         29         8      E    450.07         0
RT FROM C:                104        398       294      C     12.23         0
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HCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
E:03-02-1992                TIME:12:10:23
mmonwealth Ave./Fr. Herlihy Terr - Build 1996 AM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=hbam       GEOMETRICS=hbam
: A- -B
    |
    C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 4 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Fr. Herl.
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH         A: Comm. EB    B: Comm. WB    C: Fr. Herl.
FTS              0.00           0.00           0.00
RUS              0.00           0.00           0.00
GHTS             0.00           0.00           0.00


PROACH         A: Comm. EB    B: Comm. WB    C: Fr. Herl.
                LT   TH   RT   LT   TH   RT   LT   TH   RT
LUME             0  896  222   31  614    0    0    0    1
F                0.85           0.85           0.85
 VOLUME          0 1054  261   36  722    0    0    0    1
RCENT GRADE     -1.00           0.00           1.00
RCENT CYCLES       0.00           0.00           0.00
SSENGER CARS      98.00          96.00         %100.00
RCENT LT TRU       0.00           0.00           0.00
RCENT HV TRU       2.00           4.00           0.00
SS CAR/HR        0             38             0    0    1


EP 1 RIGHT TURNS FROM      C:Fr. Herl.
NFLICTING FLOWS                       658
ITICAL GAPS                           5.0
PACITY                                598
TUAL CAPACITY                         598


EP 2 LEFT TURNS FROM      B:Comm. WB
NFLICTING FLOWS                      1315
ITICAL GAPS                           5.0
PACITY                                263
PACITY USED                           14%
PEDANCE FACTOR                       0.91
TUAL CAPACITY                         263
```

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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:03-02-1992              TIME:12:10:23
Commonwealth Ave./Fr. Herlihy Terr - Build 1996 AM Peak Hour


STEP 3 LEFT TURNS FROM      C:Fr. Herl.
CONFLICTING FLOWS                     1944
CRITICAL GAPS                          6.5
CAPACITY                                42
ACTUAL CAPACITY                         38


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:               38         263       225      C     16.00         0.

ALL MOVES FROM C:         1         598       597      A      6.03         0.
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NCH PROGRAM VERSION Date 4-[illegible]
35 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
TE:03-02-1992                TIME:12:11:40
mmonwealth Ave./Fr. Herlihy Terr - Build Cond. 1996 PM Peak Hour


ST DATASETS LOADED OR SAVED
LUME=hbpm         GEOMETRICS=hbpm
Y: A- -B
      |
      C
NERAL CHARACTERISTICS
PULATION GREATER THAN 250,000: YES
NTROLS: FROM C: STOP
EVAILING SPEED:  30  MPH
IN STREET # OF LANES: 4 LANES
IN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

NOR STREET LANES
PROACH: C: Fr. Herl.
ARED LEFT AND RIGHT TURN LANE: YES
RGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
GHT TURN ACCELERATION LANE ON MAJOR: NO


GHT DISTANCE RESTRICTIONS (in seconds)
PROACH          A: Comm. EB     B: Comm. WB     C: Fr. Herl.
FTS               0.00            0.00            0.00
RUS               0.00            0.00            0.00
GHTS              0.00            0.00            0.00


PROACH          A: Comm. EB     B: Comm. WB     C: Fr. Herl.
                LT    TH   RT   LT    TH   RT   LT    TH   RT
LUME             0   672  179   15   835    0    0     0    1
F                 0.88            0.91            0.80
J VOLUME         0   764  203   16   918    0    0     0    1
RCENT GRADE     -1.00             0.00            1.00
RCENT CYCLES       0.00            0.00            0.00
SSENGER CARS      99.00           98.00          %100.00
RCENT LT TRU       0.00            0.00            0.00
RCENT HV TRU       1.00            2.00            0.00
SS CAR/HR        0               17              0     0    1


EP 1 RIGHT TURNS FROM      C:Fr. Herl.
NFLICTING FLOWS                       484
ITICAL GAPS                           5.0
PACITY                                727
TUAL CAPACITY                         727


EP 2 LEFT TURNS FROM      B:Comm. WB
NFLICTING FLOWS                       967
ITICAL GAPS                           5.0
PACITY                                414
PACITY USED                             4%
PEDANCE FACTOR                       0.98
TUAL CAPACITY                         414
```

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1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:03-02-1992                TIME:12:11:40
Commonwealth Ave./Fr. Herlihy Terr. - Build Cond. 1996 PM Peak Hour


STEP 3 LEFT TURNS FROM       C:Fr. Herl.
CONFLICTING FLOWS                       1799
CRITICAL GAPS                            6.5
CAPACITY                                  56
ACTUAL CAPACITY                           55


                     SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT                 DEMAND    CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG

LT FROM B:                 17         414       397     B       9.07         0

ALL MOVES FROM C:           1         727       726     A       4.96         0
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
ild Cond. 1996 AM Peak Hour
e:02-27-1992              time:20:35:50
ST DATA SET NAMES LOADED OR SAVED
LUME=lnbam      GEOMETRICS=lnbam      SIGNAL=lnbam
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES      # OF LANES     LANE WIDTH     CROSS
R  LT  TH    RT    LT TH RT      LT   TH   RT    WALK
  381  512   15     0  2  1     0.0 12.0 12.0     0
  291  572   52     1  2  0    10.0 10.0  0.0     0
   73  205   50     1  1  0    10.0 10.0  0.0     0
    0    1    1     0  1  0     0.0 12.0  0.0     0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK             PEDESTRIANS        ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
 -1.0%  2.0%   N     0    0   .850    0   n     7.0    3
  0.0%  4.0%   N     0    0   .850    0   n     7.0    3
  1.0%  3.0%   N     0    0   .850    0   n     7.0    3
  0.0%  0.0%   N     0    0   .900    0   n     7.0    3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
                          *  *  *     *  *  *     17.0   5     A
  *  *  *                                         30.0   5     A
     *  *                                         11.0   8     A
              *  *  *                             21.0   5     A

CLE= 102.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   381  512   15 .850   448  602   18
   291  572   52 .850   342  673   61
    73  205   50 .850    86  241   59
     0    1    1 .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP  FLOW N   LU     v Plt  Prt
  LT-TH     1051 2 1.05 1103 0.43 0.00
  RT          18 1 1.00   18 0.00 1.00
  LT         342 1 1.00  342 1.00 0.00
  TH-RT      734 2 1.05  771 0.00 0.08
```

```
NB   TH-RT             300 1 1.00   300 0.00 0.20
SB   TH-RT               2 1 1.00     2 0.00 0.50

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED       VOLUMES       % OPPOSING LEFT TURN      # LANES      OPPOSI
                  LT   TH   RT        LT   TH   RT        LT   TH   RT      VOLUME
EASTBOUND        342  673   61         0    0    0         1    2    0         0
WESTBOUND        448  602   18         0    0    0         0    2    1         0
NORTHBOUND         0    1    1       100  100  100         0    1    0         2

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP   IDEAL N  Fwid   Fhv   Fgr  Fpark  Fbus  Farea   Frt   Flt     s
EB  LT-TH      1800  2 1.000 0.990 1.005 1.000 1.000 1.000 1.000 1.000 3582
EB  RT         1800  1 1.000 0.990 1.005 1.000 1.000 1.000 0.850 1.000 1522
WB  LT         1800  1 0.933 0.980 1.000 1.000 1.000 1.000 1.000 0.950 1565
WB  TH-RT      1800  2 0.933 0.980 1.000 1.000 1.000 1.000 0.987 1.000 3253
NB  LT         1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB  TH-RT      1800  1 0.933 0.985 0.995 1.000 1.000 1.000 0.971 1.000 1598
SB  TH-RT      1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
NB 102  17  1   86  300   86 1.00  1    2 0.00
CALCULATIONS
DIR Sop   Yo     Gu    Fs     Pl     Gq    Pt     Gf        El    Fm    Flt
NB 1800 0.001 16.895 0.874 1.000  0.105 0.000  0.000     1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v    s  v/s  g/C    c  v/c  CRITICAL
EB  LT-TH     1103 3582 0.31 0.45 1615 0.68     *
EB  RT          18 1522 0.01 0.45  687 0.03
WB  LT         342 1565 0.22 0.21  322 1.06
WB  TH-RT      771 3253 0.24 0.21  670 1.15     *
NB  LT          86 1647 0.05 0.17  274 0.31
NB  TH-RT      300 1598 0.19 0.17  266 1.13     *
SB  TH-RT        2 1499 0.00 0.17  250 0.01

CYCLE=102.0  LOST=18.0  SUM V/S CRIT= 0.73 TOTAL V/C= 0.89

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C      d1     c      d2   PF   Delay LOS Avg Q  95% Q
EB  LT-TH     0.68 0.45 102.0  16.88 1615    0.85 0.85  15.07  C  16.3
EB  RT        0.03 0.45 102.0  11.82  687    0.00 0.85  10.05  B   0.3
WB  LT        1.06 0.21 102.0  31.29  322   58.79 1.00  90.08  F  12.4
WB  TH-RT     1.15 0.21 102.0  32.03  670   85.99 0.85 100.32  F  28.7
NB  LT        0.31 0.17 102.0  28.40  274    0.22 0.85  24.33  C   2.0
NB  TH-RT     1.13 0.17 102.0  33.14  266   91.06 0.85 105.57  F  12.3
SB  TH-RT     0.01 0.17 102.0  26.96  250    0.00 0.85  22.91  C   0.1

DIR Delay LOS
EB  14.99  B
WB  97.17  F
NB  87.49  F
SB  22.91  C
INTERSECTION DELAY = 60.55 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  78.7 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  18.4 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  12.6 secs green,   5.0 secs yellow + red clear
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CM PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
 ld Cond. 1996 PM Peak Hour
e:03-02-1992                time:12:24:45
ST DATA SET NAMES LOADED OR SAVED
LUME=lbpm         GEOMETRICS=lbpm         SIGNAL=lbom
CATED IN CBD:n
LUME & GEOMETRICS
       VOLUMES          # OF LANES       LANE WIDTH       CROSS
R  LT    TH    RT      LT  TH  RT       LT    TH    RT     WALK
E  252   419    7       0   2   1       0.0  12.0  12.0      0
E  314   705   57       1   2   0      10.0  10.0   0.0      0
E  151   312  109       1   1   0      10.0  10.0   0.0      0
E    0     1    1       0   1   0       0.0  12.0   0.0      0

AFFIC & ROADWAY CONDITIONS
                ADJ  PARK                  PEDESTRIANS            ARR
R GRADE  %HV    Y/N MOVES  BUSES   PHF  CROSS  BUT  MIN TIME TYPE
E -1.0%  1.0%    N     0      0    .880    0     n       7.0     3
E  0.0%  2.0%    N     0      0    .910    0     n       7.0     3
E  1.0%  2.0%    N     0      0    .850    0     n       7.0     3
E  0.0%  0.0%    N     0      0    .900    0     n       7.0     3

ASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN   Y+R  PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1                         *  *  *     *  *  *       15.0     5     A
2 *  *  *                                           19.0     5     A
3    *  *                                           11.0     8     A
4             *  *  *                               26.0     5     A

CLE=  94.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV   THV   RTV    PHF   LTFR  THFR  RTFR
E  252   419     7  .880    286   476     8
E  314   705    57  .910    345   775    63
E  151   312   109  .850    178   367   128
E    0     1     1  .900      0     1     1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N    LU     v   Plt   Prt
E LT-TH       763 2  1.05   801 0.38 0.00
E RT            8 1  1.00     8 0.00 1.00
E LT          345 1  1.00   345 1.00 0.00
E TH-RT       837 2  1.05   879 0.00 0.07
E LT          178 1  1.00   178 1.00 0.00
E TH-RT       495 1  1.00   495 0.00 0.26
E TH-RT         2 1  1.00     2 0.00 0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                      OPPOSING APPROACH
NG OPPOSED          VOLUMES         % OPPOSING LEFT TURN      # LANES       OPPOSING
                  LT    TH    RT         LT    TH    RT        LT   TH   RT       VOLUME
STBOUND          345   775    63          0     0     0         1    2    0          0
STBOUND          286   476     8          0     0     0         0    2    1          0
RTHBOUND           0     1     1        100   100   100         0    1    0          1

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP  IDEAL N   Fwid    Fhv    Fgr  Fpark   Fbus  Farea    Frt    Flt      S
  LT-TH      1800  2 1.000  0.995  1.005  1.000  1.000  1.000  1.000  1.000  3600
  RT         1800  1 1.000  0.995  1.005  1.000  1.000  1.000  0.850  1.000  1530
  LT         1800  1 0.933  0.990  1.000  1.000  1.000  1.000  1.000  0.950  1580
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NB   LT          1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 1.000 1655
NB   TH-RT       1800  1 0.933 0.990 0.995 1.000 1.000 1.000 0.961 1.000 1591
SB   TH-RT       1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C    G   N    Va    Vm   Vlt  Plt No    Vo Plto
NB  94   15   1   178   495   178 1.00  1     2 0.00
CALCULATIONS
DIR Sop     Yo      Gu     Fs     Pl      Gq     Pt      Gf        El     Fm    Flt
NB 1800 0.001 14.902 0.874 1.000  0.098 0.000  0.000     1.288 1.000 1.000

APACITY ANALYSIS WORKSHEET
 IR LN GROUP      v     s   v/s  g/C    c   v/c  CRITICAL
EB   LT-TH       801 3600 0.22 0.37 1340 0.60      *
EB   RT            8 1530 0.01 0.37  570 0.01
WB   LT          345 1580 0.22 0.28  437 0.79
WB   TH-RT       879 3289 0.27 0.28  910 0.97      *
NB   LT          178 1655 0.11 0.16  264 0.67
NB   TH-RT       495 1591 0.31 0.16  254 1.95      *
SB   TH-RT         2 1499 0.00 0.16  239 0.01

CYCLE= 94.0  LOST=18.0  SUM V/S CRIT= 0.80 TOTAL V/C= 0.99

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c        d2   PF    Delay LOS Avg Q  95%
EB   LT-TH     0.60 0.37  94.0  18.10 1340      0.54 0.85   15.84  C  12.5
EB   RT        0.01 0.37  94.0  14.15  570      0.00 0.85   12.02  B   0.1
WB   LT        0.79 0.28  94.0  23.91  437      6.48 1.00   30.39  D   6.5
WB   TH-RT     0.97 0.28  94.0  25.51  910     16.32 0.85   35.55  D  16.2
NB   LT        0.67 0.16  94.0  28.26  264      4.48 0.85   27.83  D   3.9
NB   TH-RT     1.95 0.16  94.0  36.64  254  1294.10 0.85 1131.13  F 161.1
SB   TH-RT     0.01 0.16  94.0  25.27  239      0.00 0.85   21.48  C   0.0

DIR Delav LOS
EB   15.80  C
WB   34.10  D
NB 839.87   F
SB   21.48  C
INTERSECTION DELAY =228.86 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY is  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 114.8 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  28.0 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is   7.5 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   7.5 secs green,   8.0 secs yellow + red clear
suggested timing phase 4 is  24.0 secs green,   5.0 secs yellow + red clear
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CAPACITY ANALYSIS WITH IMPROVEMENTS

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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
 st. Cond. 1996 AM Peak Hour with Improvements
 e:03-02-1992             time:14:34:43
ST DATA SET NAMES LOADED OR SAVED
LUME=leamm      GEOMETRICS=leamm      SIGNAL=leamm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES      # OF LANES    LANE WIDTH      CROSS
R  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
  366  492   13     1  1  1    12.0 12.0 12.0     0
  293  550   50     1  2  1    10.0 10.0 10.0     0
   65  176   37     1  1  1    10.0 10.0 10.0     0
    0    1    1     0  1  0     0.0 12.0  0.0     0

AFFIC & ROADWAY CONDITIONS
              ADJ PARK             PEDESTRIANS         ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
 -1.0%  2.0%   N     0    0   .850    0   n     7.0     3
  0.0%  4.0%   N     0    0   .850    0   n     7.0     3
  1.0%  3.0%   N     0    0   .850    0   n     7.0     3
  0.0%  0.0%   N     0    0   .900    0   n     7.0     3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *           *                                   30.0   5    A
     *  *        *  *                             23.0   5    A
     *  *                                          8.0   5    A
                          *  *  *     *  *  *     17.0   5    A

LE=  98.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   366  492   13  .850   431  579   15
   293  550   50  .850   345  647   59
    65  176   37  .850    76  207   44
     0    1    1  .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N   LU     v  Plt  Prt
  LT          431 1 1.00  431 1.00 0.00
  TH          579 1 1.00  579 0.00 0.00
  RT           15 1 1.00   15 0.00 1.00
  LT          345 1 1.00  345 1.00 0.00
  TH          647 2 1.05  679 0.00 0.00
  RT           59 1 1.00   59 0.00 1.00
  LT           76 1 1.00   76 1.00 0.00
  TH          207 1 1.00  207 0.00 0.00
  RT           44 1 1.00   44 0.00 1.00
  TH-RT         2 1 1.00    2 0.00 0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                OPPOSING APPROACH
ING OPPOSED       VOLUMES      % OPPOSING LEFT TURN    # LANES    OPPOSING
               LT   TH   RT  .     LT   TH   RT       LT  TH  RT   VOLUME
STBOUND       345  647.  59       100    0    0        1   2   1       0
STBOUND       431  579   15       100    0    0        1   1   1       0
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SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid    Fhv    Fgr  Fpark  Fbus  Farea   Frt    Flt     s
EB   LT        1800  1 1.000 0.990 1.005 1.000 1.000 1.000 1.000 0.950 1702
EB   TH        1800  1 1.000 0.990 1.005 1.000 1.000 1.000 1.000 1.000 1791
EB   RT        1800  1 1.000 0.990 1.005 1.000 1.000 1.000 0.850 1.000 1522
WB   LT        1800  1 0.933 0.980 1.000 1.000 1.000 1.000 1.000 0.950 1565
WB   TH        1800  2 0.933 0.980 1.000 1.000 1.000 1.000 1.000 1.000 3294
WB   RT        1800  1 0.933 0.980 1.000 1.000 1.000 1.000 0.850 1.000 1400
NB   LT        1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB   TH        1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB   RT        1800  1 0.933 0.985 0.995 1.000 1.000 1.000 0.850 1.000 1400
SB   TH-RT     1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm   Vlt  Plt No   Vo Plto
NB  98  17  1   76  251   76 1.00  1    2 0.00
CALCULATIONS
DIR Sop   Yo     Gu     Fs     Pl     Gq     Pt     Gf        El    Fm    Flt
NB 1800 0.001 16.900 0.874 1.000  0.100 0.000  0.000    1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v    s  v/s  g/C    c  v/c  CRITICAL
EB  LT        431 1702 0.25 0.31  521 0.83     *
EB  TH        579 1791 0.32 0.37  658 0.88     *
EB  RT         15 1522 0.01 0.37  559 0.03
WB  LT        345 1565 0.22 0.31  479 0.72
WB  TH        679 3294 0.21 0.23  773 0.88
WB  RT         59 1400 0.04 0.23  329 0.18
NB  LT         76 1647 0.05 0.17  286 0.27
NB  TH        207 1647 0.13 0.17  286 0.72     *
NB  RT         44 1400 0.03 0.17  243 0.18
SB  TH-RT       2 1499 0.00 0.17  260 0.01

CYCLE= 98.0  LOST=15.0  SUM V/S CRIT= 0.70 TOTAL V/C= 0.83

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C     d1    c      d2   PF   Delay LOS Avg Q  95%
EB  LT       0.83 0.31  98.0  24.00  521    7.34 1.00  31.35  D   8.1
EB  TH       0.88 0.37  98.0  22.02  658    9.25 0.85  26.58  D  10.0
EB  RT       0.03 0.37  98.0  15.06  559    0.00 0.85  12.80  B   0.3
WB  LT       0.72 0.31  98.0  23.00  479    3.59 1.00  26.58  D   6.5
WB  TH       0.88 0.23  98.0  27.48  773    8.03 0.85  30.18  D  13.5
WB  RT       0.18 0.23  98.0  22.77  329    0.03 0.85  19.38  C   1.2
NB  LT       0.27 0.17  98.0  26.68  286    0.13 0.85  22.78  C   1.7
NB  TH       0.72 0.17  98.0  29.10  286    5.99 0.85  29.82  D   4.7
NB  RT       0.18 0.17  98.0  26.26  243    0.04 0.85  22.35  C   1.0
SB  TH-RT    0.01 0.17  98.0  25.48  260    0.00 0.85  21.66  C   0.1

DIR Delay LOS
EB  28.38  D
WB  28.45  D
NB  27.18  D
SB  21.66  C
INTERSECTION DELAY = 28.24 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  57.4 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  27.0 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  25.6 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   3.4 secs green,   5.0 secs yellow + red clear
```

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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
-Build Cond. 1996 AM Peak Hour with Improvements
te:02-27-1992              time:19:43:11
ST DATA SET NAMES LOADED OR SAVED
LUME=lnbam        GEOMETRICS=lnbamm       SIGNAL=lnbamm
CATED IN CBD:n
LUME & GEOMETRICS
       VOLUMES          # OF LANES       LANE WIDTH       CROSS
R   LT   TH    RT     LT  TH  RT      LT   TH    RT     WALK
    381  512   13      1   1   1     12.0 12.0 12.0      0
    310  572   52      1   2   1     10.0 10.0 10.0      0
     71  205   50      1   1   1     10.0 10.0 10.0      0
      0    1    1      0   1   0      0.0 12.0  0.0      0

AFFIC & ROADWAY CONDITIONS
                ADJ PARK                  PEDESTRIANS          ARR
R GRADE  %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
 -1.0%  2.0%    N     0     0   .800    0    n     7.0     3
  0.0%  4.0%    N     0     0   .810    0    n     7.0     3
  1.0%  3.0%    N     0     0   .800    0    n     7.0     3
  0.0%  0.0%    N     0     0   .900    0    n     7.0     3

ASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
  l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
  *            *                                     30.0    5     A
     *  *         *  *                               23.0    5     A
     *  *                                             8.0    5     A
                            *  *  *      *  *  *     17.0    5     A

CLE=  98.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R   LTV  THV  RTV   PHF  LTFR THFR RTFR
    381  512   13  .800   476  640   16
    310  572   52  .810   383  706   64
     71  205   50  .800    89  256   63
      0    1    1  .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N   LU     v   Plt   Prt
  LT          476 1 1.00   476 1.00 0.00
  TH          640 1 1.00   640 0.00 0.00
  RT           16 1 1.00    16 0.00 1.00
  LT          383 1 1.00   383 1.00 0.00
  TH          706 2 1.05   741 0.00 0.00
  RT           64 1 1.00    64 0.00 1.00
  LT           89 1 1.00    89 1.00 0.00
  TH          256 1 1.00   256 0.00 0.00
  RT           63 1 1.00    63 0.00 1.00
  TH-RT         2 1 1.00     2 0.00 0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                 OPPOSING APPROACH
ING OPPOSED         VOLUMES         % OPPOSING LEFT TURN      # LANES       OPPOSING
```

```
EASTBOUND        383   706    64         100     0     0          1    2    1        0
WESTBOUND        476   640    16         100     0     0          1    1    1        0
NORTHBOUND         0     1     1         100   100   100          0    1    0        2

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv    Fgr  Fpark  Fbus  Farea   Frt    Flt     s
EB  LT        1800  1 1.000 0.990 1.005 1.000 1.000 1.000 1.000 0.950 1702
EB  TH        1800  1 1.000 0.990 1.005 1.000 1.000 1.000 1.000 1.000 1791
EB  RT        1800  1 1.000 0.990 1.005 1.000 1.000 1.000 0.850 1.000 1522
WB  LT        1800  1 0.933 0.980 1.000 1.000 1.000 1.000 1.000 0.950 1565
WB  TH        1800  2 0.933 0.980 1.000 1.000 1.000 1.000 1.000 1.000 3294
WB  RT        1800  1 0.933 0.980 1.000 1.000 1.000 1.000 0.850 1.000 1400
NB  LT        1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB  TH        1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB  RT        1800  1 0.933 0.985 0.995 1.000 1.000 1.000 0.850 1.000 1400
SB  TH-RT     1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N    Va    Vm   Vlt   Plt No    Vo Plto
NB   98   17   1    89   319    89 1.00  1      2 0.00
CALCULATIONS
DIR Sop     Yo      Gu     Fs     Pl      Gq     Pt      Gf        El    Fm    Flt
NB 1800 0.001 16.900 0.874 1.000  0.100 0.000  0.000    1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  LT         476 1702 0.28 0.31   521 0.91      *
EB  TH         640 1791 0.36 0.37   658 0.97      *
EB  RT          16 1522 0.01 0.37   559 0.03
WB  LT         383 1565 0.24 0.31   479 0.80
WB  TH         741 3294 0.23 0.23   773 0.96
WB  RT          64 1400 0.05 0.23   329 0.20
NB  LT          89 1647 0.05 0.17   286 0.31
NB  TH         256 1647 0.16 0.17   286 0.90      *
NB  RT          63 1400 0.04 0.17   243 0.26
SB  TH-RT        2 1499 0.00 0.17   260 0.01

CYCLE= 98.0  LOST=15.0  SUM V/S CRIT= 0.79 TOTAL V/C= 0.94

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C     d1     c      d2    PF    Delay LOS Avg Q  95%
EB  LT       0.91 0.31  98.0  24.90  521   14.83 1.00   39.73  D    9.8
EB  TH       0.97 0.37  98.0  23.19  658   21.10 0.85   37.65  D   12.2
EB  RT       0.03 0.37  98.0  15.07  559    0.00 0.85   12.81  B    0.3
WB  LT       0.80 0.31  98.0  23.74  479    6.41 1.00   30.14  D    7.2
WB  TH       0.96 0.23  98.0  28.15  773   16.84 0.85   38.24  D   14.9
WB  RT       0.20 0.23  98.0  22.86  329    0.04 0.85   19.46  C    1.3
NB  LT       0.31 0.17  98.0  26.89  286    0.21 0.85   23.03  C    2.0
NB  TH       0.90 0.17  98.0  30.13  286   19.99 0.85   42.60  E    5.9
NB  RT       0.26 0.17  98.0  26.63  243    0.13 0.85   22.75  C    1.4
SB  TH-RT    0.01 0.17  98.0  25.48  260    0.00 0.85   21.66  C    0.1

DIR Delay LOS
EB  38.17  D
WB  34.62  D
NB  35.30  D
SB  21.66  C
INTERSECTION DELAY = 36.18 INTERSECTION LOS=D
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NCH PROGRAM VERSION DATE 4-29-1988
95 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
ild Cond. 1996 AM Peak Hour with Improvements
te:02-27-1992              time:19:39:16
ST DATA SET NAMES LOADED OR SAVED
LUME=1bam         GEOMETRICS=1bamm        SIGNAL=1bamm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES         # OF LANES      LANE WIDTH      CROSS
R  LT    TH    RT     LT TH RT       LT    TH    RT     WALK
  381   512    15      1  1  1      12.0 12.0 12.0      0
  291   572    52      1  2  1      10.0 10.0 10.0      0
   73   205    50      1  1  1      10.0 10.0 10.0      0
    0     1     1      0  1  0       0.0 12.0  0.0      0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK                 PEDESTRIANS         ARR
R GRADE %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME TYPE
 -1.0%  2.0%    N      0     0   .800    0   n     7.0    3
  0.0%  4.0%    N      0     0   .810    0   n     7.0    3
  1.0%  3.0%    N      0     0   .800    0   n     7.0    3
  0.0%  0.0%    N      0     0   .900    0   n     7.0    3

ASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *           *                                     30.0   5    A
     *  *        *  *                               23.0   5    A
     *  *                                            8.0   5    A
                          *  *  *     *  *  *      17.0   5    A

CLE=  98.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   381  512   15  .800   476  640   19
   291  572   52  .810   359  706   64
    73  205   50  .800    91  256   63
     0    1    1  .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP  FLOW N   LU    v   Plt  Prt
  LT         476 1 1.00  476 1.00 0.00
  TH         640 1 1.00  640 0.00 0.00
  RT          19 1 1.00   19 0.00 1.00
  LT         359 1 1.00  359 1.00 0.00
  TH         706 2 1.05  741 0.00 0.00
  RT          64 1 1.00   64 0.00 1.00
  LT          91 1 1.00   91 1.00 0.00
  TH         256 1 1.00  256 0.00 0.00
  RT          63 1 1.00   63 0.00 1.00
  TH-RT        2 1 1.00    2 0.00 0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                    OPPOSING APPROACH
ING OPPOSED      VOLUMES      % OPPOSING LEFT TURN     # LANES      OPPOSING
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EASTBOUND        [illegible] [illegible]  64        100    0    0          1   2   1       [illegible]
WESTBOUND          4.6  640   19        100    0    0          1   1   1       [illegible]
NORTHBOUND           0    1    1        100  100  100          0   1   0        2

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP   IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt     s
EB  LT         1800  1 1.000 0.990 1.005 1.000 1.000 1.000 1.000 0.950 1702
EB  TH         1800  1 1.000 0.990 1.005 1.000 1.000 1.000 1.000 1.000 1791
EB  RT         1800  1 1.000 0.990 1.005 1.000 1.000 1.000 0.850 1.000 1522
WB  LT         1800  1 0.933 0.980 1.000 1.000 1.000 1.000 1.000 0.950 1565
WB  TH         1800  2 0.933 0.980 1.000 1.000 1.000 1.000 1.000 1.000 3294
WB  RT         1800  1 0.933 0.980 1.000 1.000 1.000 1.000 0.850 1.000 1400
NB  LT         1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB  TH         1800  1 0.933 0.985 0.995 1.000 1.000 1.000 1.000 1.000 1647
NB  RT         1800  1 0.933 0.985 0.995 1.000 1.000 1.000 0.850 1.000 1400
SB  TH-RT      1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N    Va   Vm   Vlt  Plt No   Vo Plto
NB  98  17  1    91  319    91 1.00  1    2 0.00
CALCULATIONS
DIR Sop   Yo     Gu     Fs    Pl      Gq    Pt     Gf         El    Fm   Flt
NB 1800 0.001 16.900 0.874 1.000  0.100 0.000  0.000     1.288 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s  v/s  g/C    c  v/c  CRITICAL
EB  LT         476 1702 0.28 0.31  521 0.91     *
EB  TH         640 1791 0.36 0.37  658 0.97     *
EB  RT          19 1522 0.01 0.37  559 0.03
WB  LT         359 1565 0.23 0.31  479 0.75
WB  TH         741 3294 0.23 0.23  773 0.96
WB  RT          64 1400 0.05 0.23  329 0.20
NB  LT          91 1647 0.06 0.17  286 0.32
NB  TH         256 1647 0.16 0.17  286 0.90     *
NB  RT          63 1400 0.04 0.17  243 0.26
SB  TH-RT        2 1499 0.00 0.17  260 0.01

CYCLE= 98.0  LOST=15.0  SUM V/S CRIT= 0.79 TOTAL V/C= 0.94

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  LT        0.91 0.31  98.0  24.90  521   14.83 1.00  39.73  D    9.8
EB  TH        0.97 0.37  98.0  23.19  658   21.10 0.85  37.65  D   12.2
EB  RT        0.03 0.37  98.0  15.09  559    0.00 0.85  12.83  B    0.3
WB  LT        0.75 0.31  98.0  23.27  479    4.47 1.00  27.74  D    6.8
WB  TH        0.96 0.23  98.0  28.15  773   16.84 0.85  38.24  D   14.9
WB  RT        0.20 0.23  98.0  22.86  329    0.04 0.85  19.46  C    1.3
NB  LT        0.32 0.17  98.0  26.93  286    0.23 0.85  23.09  C    2.1
NB  TH        0.90 0.17  98.0  30.13  286   19.99 0.85  42.60  E    5.9
NB  RT        0.26 0.17  98.0  26.63  243    0.13 0.85  22.75  C    1.4
SB  TH-RT     0.01 0.17  98.0  25.48  260    0.00 0.85  21.66  C    0.1

DIR Delay LOS
EB  38.11  D
WB  33.96  D
NB  35.23  D
SB  21.66  C
INTERSECTION DELAY = 35.88 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  90.7 SECONDS
for chosen cycle length  90.0
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
ist. Cond. 1992 PM Peak Hour with Improv.
te:03-02-1992             time:14:37:43
ST DATA SET NAMES LOADED OR SAVED
LUME=1epmm      GEOMETRICS=1epmm      SIGNAL=1epmm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES      # OF LANES     LANE WIDTH     CROSS
R  LT    TH    RT    LT TH RT      LT    TH    RT    WALK
  242  403    5      1  1  1     12.0 12.0 12.0      0
  248  677   55      1  2  1     10.0 10.0 10.0      0
  149  299  107      1  1  1     10.0 10.0 10.0      0
    0    1    1      0  1  0      0.0 12.0  0.0      0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK                  PEDESTRIANS        ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
 -1.0%  1.0%   N     0    0   .880   0   n     7.0    3
  0.0%  2.0%   N     0    0   .910   0   n     7.0    3
  1.0%  2.0%   N     0    0   .850   0   n     7.0    3
  0.0%  0.0%   N     0    0   .900   0   n     7.0    3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *           *                                   26.0   5    A
     *  *        *  *                             26.0   5    A
     *  *                                          7.0   0    A
                          *  *  *     *  *  *     23.0   5    A

CLE= 102.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV    PHF  LTFR THFR RTFR
   242  403    5  .880   275  458    6
   248  677   55  .910   273  744   60
   149  299  107  .850   175  352  126
     0    1    1  .900     0    1    1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP  FLOW N   LU    v  Plt  Prt
  LT         275 1 1.00  275 1.00 0.00
  TH         458 1 1.00  458 0.00 0.00
  RT           6 1 1.00    6 0.00 1.00
  LT         273 1 1.00  273 1.00 0.00
  TH         744 2 1.05  781 0.00 0.00
  RT          60 1 1.00   60 0.00 1.00
  LT         175 1 1.00  175 1.00 0.00
  TH         352 1 1.00  352 0.00 0.00
  RT         126 1 1.00  126 0.00 1.00
  TH-RT        2 1 1.00    2 0.00 0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                OPPOSING APPROACH
ING OPPOSED       VOLUMES      % OPPOSING LEFT TURN      # LANES     OPPOSING
               LT   TH   RT         LT   TH   RT        LT  TH  RT     VOLUME
STBOUND       273  744   60        100    0    0         1   2   1        0
STBOUND       275  458    6        100    0    0         1   1   1        0
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SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv    Fgr  Fpark  Fbus  Farea   Frt    Flt    s
EB   LT        1800  1 1.000 0.995 1.005 1.000 1.000 1.000 1.000 0.950 1710
EB   TH        1800  1 1.000 0.995 1.005 1.000 1.000 1.000 1.000 1.000 1800
EB   RT        1800  1 1.000 0.995 1.005 1.000 1.000 1.000 0.850 1.000 1530
WB   LT        1800  1 0.933 0.990 1.000 1.000 1.000 1.000 1.000 0.950 1580
WB   TH        1800  2 0.933 0.990 1.000 1.000 1.000 1.000 1.000 1.000 3327
WB   RT        1800  1 0.933 0.990 1.000 1.000 1.000 1.000 0.850 1.000 1414
NB   LT        1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 0.947 1568
NB   TH        1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 1.000 1655
NB   RT        1800  1 0.933 0.990 0.995 1.000 1.000 1.000 0.850 1.000 1407
SB   TH-RT     1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C    G   N    Va   Vm   Vlt  Plt No   Vo Plto
NB 102  23  1  175  478  175 1.00  1    2 0.00
CALCULATIONS
DIR Sop    Yo     Gu    Fs     Pl     Gq    Pt     Gf         El    Fm   Flt
NB 1800 0.001 22.902 0.874 1.000  0.098 0.000  0.000     1.288 0.947 0.947

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s  v/s  g/C     c  v/c  CRITICAL
EB   LT        275 1710 0.16 0.25  436 0.63
EB   TH        458 1800 0.25 0.37  671 0.68      *
EB   RT          6 1530 0.00 0.37  570 0.01
WB   LT        273 1580 0.17 0.25  403 0.68      *
WB   TH        781 3327 0.23 0.25  848 0.92
WB   RT         60 1414 0.04 0.25  360 0.17
NB   LT        175 1568 0.11 0.23  353 0.50
NB   TH        352 1655 0.21 0.23  373 0.94      *
NB   RT        126 1407 0.09 0.23  317 0.40
SB   TH-RT       2 1499 0.00 0.23  338 0.01

CYCLE=102.0  LOST=15.0  SUM V/S CRIT= 0.64 TOTAL V/C= 0.75

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C       d1     c        d2   PF   Delay LOS Avg Q  95% Q
EB   LT       0.63 0.25 102.0  25.64  436      2.08 1.00  27.72  D   5.8
EB   TH       0.68 0.37 102.0  20.47  671      2.00 0.85  19.09  C   8.1
EB   RT       0.01 0.37 102.0  15.32  570      0.00 0.85  13.02  B   0.1
WB   LT       0.68 0.25 102.0  26.00  403      3.10 1.00  29.11  D   5.8
WB   TH       0.92 0.25 102.0  28.12  848     10.98 0.85  33.24  D  15.7
WB   RT       0.17 0.25 102.0  22.48  360      0.02 0.85  19.13  C   1.3
NB   LT       0.50 0.23 102.0  26.18  353      0.93 0.85  23.04  C   3.8
NB   TH       0.94 0.23 102.0  29.53  373     23.31 0.85  44.91  E   8.2
NB   RT       0.40 0.23 102.0  25.54  317      0.45 0.85  22.08  C   2.8
SB   TH-RT    0.01 0.23 102.0  23.29  338      0.00 0.85  19.79  C   0.0

DIR Delay LOS
EB  22.26  C
WB  31.46  D
NB  34.64  D
SB  19.79  C
INTERSECTION DELAY = 29.57 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  45.9 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  20.2 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  25.8 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  -1.0 secs yellow + red clear
suggested timing phase 4 is  24.9 secs green,   5.0 secs yellow + red clear
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NCH PROGRAM VERSION DATE 4-29-1988
985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
ommonwealth Ave./Lake St./St. Thomas More Dr.
o-Build Cond. 1996 PM Peak Hour with Improvements
ate:02-27-1992              time:18:16:18
AST DATA SET NAMES LOADED OR SAVED
LUME=lnbpmm      GEOMETRICS=lnbpmm      SIGNAL=lnbpmm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES          # OF LANES      LANE WIDTH       CROSS
IR   LT   TH   RT     LT  TH  RT      LT   TH   RT      WALK
B   252  419    5      1   1   1     12.0 12.0 12.0      0
B   281  705   57      1   2   1     10.0 10.0 10.0      0
B   157  313  113      1   1   1     10.0 10.0 10.0      0
B     0    1    1      0   1   0      0.0 12.0  0.0      0

RAFFIC & ROADWAY CONDITIONS
                ADJ PARK               PEDESTRIANS          ARR
IR GRADE  %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
B -1.0%  1.0%    N    0     0   .880    0    n     7.0     3
B  0.0%  2.0%    N    0     0   .910    0    n     7.0     3
B  1.0%  2.0%    N    0     0   .850    0    n     7.0     3
B  0.0%  0.0%    N    0     0   .900    0    n     7.0     3

HASINGS
   EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN  Y+R PRE/ACT
   l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
   *            *                                      24.0   5    A
      *  *         *  *                                26.0   5    A
      *  *                                              7.0   5    A
                             *  *  *      *  *  *      25.0   5    A

CLE= 102.0

LUME ADJUSTMENT WORKSHEET
ART 1 (MOVEMENT ADJUSTMENTS)
IR   LTV  THV  RTV   PHF   LTFR THFR RTFR
B    252  419    5  .880   286  476    6
B    281  705   57  .910   309  775   63
B    157  313  113  .850   185  368  133
B      0    1    1  .900     0    1    1

ART 2 (LANE GROUP ADJUSTMENTS)
IR LN GROUP  FLOW N  LU     v  Plt  Prt
B  LT         286 1 1.00  286 1.00 0.00
B  TH         476 1 1.00  476 0.00 0.00
B  RT           6 1 1.00    6 0.00 1.00
B  LT         309 1 1.00  309 1.00 0.00
B  TH         775 2 1.05  813 0.00 0.00
B  RT          63 1 1.00   63 0.00 1.00
B  LT         185 1 1.00  185 1.00 0.00
B  TH         368 1 1.00  368 0.00 0.00
B  RT         133 1 1.00  133 0.00 1.00
B  TH-RT        2 1 1.00    2 0.00 0.50

ART 3 (OPPOSING VOLUME ADJUSTMENTS)
EFT TURN                  OPPOSING APPROACH
EING OPPOSED       VOLUMES       % OPPOSING LEFT TURN      # LANES      OPPOSING
                LT   TH   RT      LT    TH    RT        LT  TH  RT     VOLUME
ASTBOUND       309  775   63     100     0     0         1   2   1        0
ESTBOUND       286  476    6     100     0     0         1   1   1        0
ORTHBOUND        0    1    1     100   100   100         0   1   0        2
```

```
SATURATION FLOW ADJUSTMENT WORKSHE
DIR LN GROUP   IDEAL N  Fwid   Fhv         Fpark  Fbus Farea    Frt    Flt     s
EB  LT          1800  1 1.000 0.995 1.005 1.000 1.000 1.000 1.000 0.950 1710
EB  TH          1800  1 1.000 0.995 1.005 1.000 1.000 1.000 1.000 1.000 1800
EB  RT          1800  1 1.000 0.995 1.005 1.000 1.000 1.000 0.850 1.000 1530
WB  LT          1800  1 0.933 0.990 1.000 1.000 1.000 1.000 1.000 0.950 1580
WB  TH          1800  2 0.933 0.990 1.000 1.000 1.000 1.000 1.000 1.000 3327
WB  RT          1800  1 0.933 0.990 1.000 1.000 1.000 1.000 0.850 1.000 1414
NB  LT          1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 0.934 1545
NB  TH          1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 1.000 1655
NB  RT          1800  1 0.933 0.990 0.995 1.000 1.000 1.000 0.850 1.000 1407
SB  TH-RT       1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
NB 102  25  1  185  501  185 1.00  1    2 0.00
CALCULATIONS
DIR Sop    Yo     Gu    Fs    Pl     Gq    Pt     Gf        El    Fm   Flt
NB 1800 0.001 24.905 0.874 1.000  0.095 0.000  0.000     1.288 0.934 0.934

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s  v/s  g/C    c  v/c  CRITICAL
EB  LT         286 1710 0.17 0.24  402 0.71
EB  TH         476 1800 0.26 0.37  671 0.71      *
EB  RT           6 1530 0.00 0.37  570 0.01
WB  LT         309 1580 0.20 0.24  372 0.83      *
WB  TH         813 3327 0.24 0.25  848 0.96
WB  RT          63 1414 0.04 0.25  360 0.17
NB  LT         185 1545 0.12 0.25  379 0.49
NB  TH         368 1655 0.22 0.25  406 0.91      *
NB  RT         133 1407 0.09 0.25  345 0.39
SB  TH-RT        2 1499 0.00 0.25  367 0.01

CYCLE=102.0  LOST=15.0  SUM V/S CRIT= 0.68 TOTAL V/C= 0.80

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C     d1    c      d2   PF   Delay LOS Avg Q  95% Q
EB  LT        0.71 0.24 102.0  27.23  402    3.99 1.00  31.21  D    6.2
EB  TH        0.71 0.37 102.0  20.75  671    2.43 0.85  19.70  C    8.5
EB  RT        0.01 0.37 102.0  15.32  570    0.00 0.85  13.02  B    0.1
WB  LT        0.83 0.24 102.0  28.17  372   10.07 1.00  38.24  D    6.7
WB  TH        0.96 0.25 102.0  28.48  848   15.89 0.85  37.72  D   16.4
WB  RT        0.17 0.25 102.0  22.52  360    0.02 0.85  19.16  C    1.3
NB  LT        0.49 0.25 102.0  25.09  379    0.81 0.85  22.01  C    4.0
NB  TH        0.91 0.25 102.0  28.41  406   16.86 0.85  38.48  D    7.9
NB  RT        0.39 0.25 102.0  24.39  345    0.37 0.85  21.05  C    2.8
SB  TH-RT     0.01 0.25 102.0  22.12  367    0.00 0.85  18.80  C    0.0

DIR Delay LOS
EB  23.94  C
WB  36.88  D
NB  30.67  D
SB  18.80  C
INTERSECTION DELAY = 31.49 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  53.3 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  21.5 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  25.1 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  -1.0 secs yellow + red clear
suggested timing phase 4 is  24.5 secs green,   5.0 secs yellow + red clear
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
mmonwealth Ave./Lake St./St. Thomas More Dr.
ild Cond. 1996 PM Peak Hour with Improvements
te:03-02-1992               time:12:26:30
ST DATA SET NAMES LOADED OR SAVED
LUME=1bpm      GEOMETRICS=1bpmm      SIGNAL=1bpmm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES        # OF LANES       LANE WIDTH      CROSS
R  LT    TH    RT     LT TH RT      LT    TH    RT     WALK
  252   419     7      1  1  1    12.0  12.0  12.0       0
  314   705    57      1  2  1    10.0  10.0  10.0       0
  151   312   109      1  1  1    10.0  10.0  10.0       0
    0     1     1      0  1  0     0.0  12.0   0.0       0

AFFIC & ROADWAY CONDITIONS
              ADJ PARK                PEDESTRIANS         ARR
R GRADE  %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
 -1.0%  1.0%   N      0     0   .880    0   n     7.0     3
  0.0%  2.0%   N      0     0   .910    0   n     7.0     3
  1.0%  2.0%   N      0     0   .850    0   n     7.0     3
  0.0%  0.0%   N      0     0   .900    0   n     7.0     3

ASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN   Y+R PRE/ACT
  l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
  *            *                                     26.0    5     A
     *  *         *  *                               26.0    5     A
     *  *                                             7.0    5     A
                            *  *  *      *  *  *     23.0    5     A

CLE= 102.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R   LTV   THV   RTV    PHF   LTFR  THFR  RTFR
    252   419     7   .880    286   476     8
    314   705    57   .910    345   775    63
    151   312   109   .850    178   367   128
      0     1     1   .900      0     1     1

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N    LU     v   Plt   Prt
  LT          286 1  1.00   286  1.00  0.00
  TH          476 1  1.00   476  0.00  0.00
  RT            8 1  1.00     8  0.00  1.00
  LT          345 1  1.00   345  1.00  0.00
  TH          775 2  1.05   813  0.00  0.00
  RT           63 1  1.00    63  0.00  1.00
  LT          178 1  1.00   178  1.00  0.00
  TH          367 1  1.00   367  0.00  0.00
  RT          128 1  1.00   128  0.00  1.00
  TH-RT         2 1  1.00     2  0.00  0.50

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                 OPPOSING APPROACH
ING OPPOSED        VOLUMES        % OPPOSING LEFT TURN      # LANES      OPPOSING
               LT    TH    RT       LT    TH    RT        LT  TH  RT     VOLUME
STBOUND       345   775    63      100     0     0         1   2   1        0
STBOUND       286   476     8      100     0     0         1   1   1        0
RTHBOUND        0     1     1      100   100   100         0   1   0        2

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP   IDEAL  N   Fwid    Fhv    Fg  Fpark   Fbus Farea    Frt    Flt    s
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EB   TH         1800  1 1.000 0.995 1.005 1.000 1.000 1.000 1.000 1.000 1800
EB   RT         1800  1 1.000 0.995 1.005 1.000 1.000 1.000 0.850 1.000 1530
WB   LT         1800  1 0.933 0.990 1.000 1.000 1.000 1.000 1.000 0.950 1580
WB   TH         1800  2 0.933 0.990 1.000 1.000 1.000 1.000 1.000 1.000 3327
WB   RT         1800  1 0.933 0.990 1.000 1.000 1.000 1.000 0.850 1.000 1414
NB   LT         1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 0.947 1568
NB   TH         1800  1 0.933 0.990 0.995 1.000 1.000 1.000 1.000 1.000 1655
NB   RT         1800  1 0.933 0.990 0.995 1.000 1.000 1.000 0.850 1.000 1407
SB   TH-RT      1800  1 1.000 1.000 1.000 1.000 1.000 1.000 0.833 1.000 1499

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C    G  N    Va   Vm  Vlt  Plt No   Vo Plto
NB 102  23  1  178  495  178 1.00  1    2 0.00
CALCULATIONS
DIR Soo   Yo     Gu    Fs    Pl     Gq    Pt    Gf        El   Fm   Flt
NB 1800 0.001 22.902 0.874 1.000  0.098 0.000  0.000    1.288 0.947 0.947

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v    s   v/s  g/C    c  v/c  CRITICAL
EB   LT        286 1710 0.17 0.25  436 0.66
EB   TH        476 1800 0.26 0.37  671 0.71       *
EB   RT          8 1530 0.01 0.37  570 0.01
WB   LT        345 1580 0.22 0.25  403 0.86       *
WB   TH        813 3327 0.24 0.25  848 0.96
WB   RT         63 1414 0.04 0.25  360 0.17
NB   LT        178 1568 0.11 0.23  353 0.50
NB   TH        367 1655 0.22 0.23  373 0.98       *
NB   RT        128 1407 0.09 0.23  317 0.40
SB   TH-RT       2 1499 0.00 0.23  338 0.01

CYCLE=102.0  LOST=15.0  SUM V/S CRIT= 0.70 TOTAL V/C= 0.83

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c      d2   PF    Delay LOS Avg Q  95%
EB   LT       0.66 0.25 102.0  25.85  436    2.50 1.00   28.35  D    6.0
EB   TH       0.71 0.37 102.0  20.75  671    2.43 0.85   19.70  C    8.5
EB   RT       0.01 0.37 102.0  15.34  570    0.00 0.85   13.04  B    0.1
WB   LT       0.86 0.25 102.0  27.53  403   11.46 1.00   38.99  D    7.4
WB   TH       0.96 0.25 102.0  28.48  848   15.89 0.85   37.72  D   16.4
WB   RT       0.17 0.25 102.0  22.52  360    0.02 0.85   19.16  C    1.3
NB   LT       0.50 0.23 102.0  26.22  353    0.98 0.85   23.12  C    3.9
NB   TH       0.98 0.23 102.0  29.88  373   31.72 0.85   52.36  E    9.4
NB   RT       0.40 0.23 102.0  25.58  317    0.48 0.85   22.15  C    2.8
SB   TH-RT    0.01 0.23 102.0  23.29  338    0.00 0.85   19.79  C    0.0

DIR Delay LOS
EB  22.85  C
WB  37.13  D
NB  38.88  D
SB  19.79  C
INTERSECTION DELAY = 33.43 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  58.1 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  23.2 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  24.2 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  -1.1 secs yellow + red clear
suggested timing phase 4 is  23.6 secs green,   5.0 secs yellow + red clear
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INCH PROGRAM VERSION DATE 4-29-1988
985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
eacon St./Chestnut St. & Rd.
M Peak Hour - Exist. Cond. with Improvements
ate:03-02-1992                time:14:43:59
AST DATA SET NAMES LOADED OR SAVED
OLUME=bceamm      GEOMETRICS=bceamm      SIGNAL=bceamm
OCATED IN CBD:n
OLUME & GEOMETRICS
       VOLUMES        # OF LANES      LANE WIDTH      CROSS
IR   LT    TH    RT     LT  TH  RT      LT    TH    RT     WALK
B   341   555     5      1   1   0     11.0  13.0   0.0     0
B     0   512    83      0   1   0      0.0  15.0   0.0     0
B     0     6     3      0   1   0      0.0  12.0   0.0     0
B    53     3   260      0   1   1      0.0  15.0  15.0     0

RAFFIC & ROADWAY CONDITIONS
                ADJ PARK                PEDESTRIANS        ARR
IR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B   0.0%  2.0%   N      0     0   .850     0   n     7.0    5
B   0.0%  2.0%   N      0     0   .850     0   n     7.0    3
B  -3.0%  0.0%   N      0     0   .850     0   n     7.0    3
B   0.0%  1.0%   N      0     0   .890     0   n     7.0    3

HASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1  *  *  *                                   *      14.0   5    A
2  *  *  *     *  *  *                              41.0   5    A
3                          *  *  *     *  *  *      10.0   5    A

YCLE=  80.0

OLUME ADJUSTMENT WORKSHEET
ART 1 (MOVEMENT ADJUSTMENTS)
IR   LTV   THV   RTV   PHF  LTFR THFR RTFR
B    341   555     5  .850   401  653    6
B      0   512    83  .850     0  602   98
B      0     6     3  .850     0    7    4
B     53     3   260  .890    60    3  292

ART 2 (LANE GROUP ADJUSTMENTS)
IR LN GROUP   FLOW N   LU     v  Plt  Prt
B  LT          401 1 1.00   401 1.00 0.00
B  TH-RT       659 1 1.00   659 0.00 0.01
B  TH-RT       700 1 1.00   700 0.00 0.14
B  TH-RT        11 1 1.00    11 0.00 0.33
B  LT-TH        63 1 1.00    63 0.95 0.00
B  RT          292 1 1.00   292 0.00 1.00

ART 3 (OPPOSING VOLUME ADJUSTMENTS)
EFT TURN                 OPPOSING APPROACH
EING OPPOSED        VOLUMES         % OPPOSING LEFT TURN      # LANES      OPPOSING
                   LT    TH    RT        LT    TH    RT        LT   TH   RT       VOLUME
ASTBOUND            0   602    98       100   100   100         0    1    0
OUTHBOUND           0     7     4       100   100   100         0    1    0

ATURATION FLOW ADJUSTMENT WORKSHEET
IR LN GROUP  IDEAL N   Fwid    Fhv    Fgr  Fpark  Fbus Farea   Frt    Flt
B  LT         1800  1 0.967 0.990 1.000 1.000 1.000 1.000 1.000 0.950
B  TH-RT      1800  1 1.033 0.990 1.000 1.000 1.000 1.000 0.999 1.000
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NB   TH-RT          1800   1  1.000 1.000 1.015 1.000 1.000 1.000 0.855 1.000 1562
SB   LT-TH          1800   1  1.100 0.995 1.000 1.000 1.000 1.000 1.000 1.000 1970
SB   RT             1800   1  1.100 0.995 1.000 1.000 1.000 1.000 0.850 1.000 1675

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N     Va    Vm    Vlt   Plt  No    Vo Plto
SB   80   10   1    63   296    60 0.95   1    11 0.00
CALCULATIONS
DIR Soo     Yo       Gu      Fs     Pl       Gq     Pt      Gf         El     Fm    Flt
SB 1800 0.006  9.586 0.868 0.946  0.414 0.054  0.051     1.296 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP      v      s  v/s  g/C     c  v/c  CRITICAL
EB  LT          401 1637 0.12 0.18   577 0.70
EB  TH-RT       659 1839 0.36 0.75 1379 0.48
WB  TH-RT       700 1727 0.41 0.51   885 0.79       *
NB  TH-RT        11 1562 0.01 0.13   195 0.05
SB  LT-TH        63 1970 0.03 0.13   246 0.26
SB  RT          292 1675 0.17 0.36   607 0.48       *

CYCLE= 80.0  LOST=10.0  SUM V/S CRIT= 0.58 TOTAL V/C= 0.66
FOR THE EASTBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
 86 LEFT TURNS ON      CHANGE INTERVAL AND  204 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c       d2    PF   Delay LOS Avg Q  95% Q
EB  LT         0.70 0.75  80.0   3.97  577     2.53 1.00    6.51  B   7.4
EB  TH-RT      0.48 0.75  80.0   2.96 1379     0.21 0.40    1.27  A   3.7
WB  TH-RT      0.79 0.51  80.0  12.15  885     3.43 0.85   13.24  B   7.6
NB  TH-RT      0.05 0.13  80.0  23.43  195     0.00 0.85   19.92  C   0.2
SB  LT-TH      0.26 0.13  80.0  24.04  246     0.12 0.85   20.54  C   1.2
SB  RT         0.48 0.36  80.0  14.97  607     0.48 0.85   13.13  B   4.1

DIR Delay LOS
EB   3.25  A
WB  13.24  B
NB  19.92  C
SB  14.45  B
INTERSECTION DELAY =  8.49 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  25.7 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  15.1 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  55.9 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   4.0 secs green,   5.0 secs yellow + red clear
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
acon St./Chestnut St. & Rd.
 Peak Hour - No-Build Cond. with Improvements
te:03-01-1992               time:13:23:26
ST DATA SET NAMES LOADED OR SAVED
LUME=bcnbamm    GEOMETRICS=bcnbamm    SIGNAL=bcnbamm
CATED IN CBD:n
LUME & GEOMETRICS
       VOLUMES        # OF LANES      LANE WIDTH      CROSS
R   LT   TH    RT     LT TH RT      LT    TH    RT     WALK
   388  589    5       1  1  0    11.0  13.0   0.0      0
     0  539   87       0  1  0     0.0  15.0   0.0      0
     0    6    3       0  1  0     0.0  12.0   0.0      0
    57    3  288       0  1  1     0.0  15.0  15.0      0

AFFIC & ROADWAY CONDITIONS
                ADJ PARK                 PEDESTRIANS          ARR
R GRADE  %HV    Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME  TYPE
  0.0%  2.0%    N      0     0   .850     0   n      7.0     5
  0.0%  2.0%    N      0     0   .850     0   n      7.0     3
 -3.0%  0.0%    N      0     0   .850     0   n      7.0     3
  0.0%  1.0%    N      0     0   .890     0   n      7.0     3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *  *  *                                   *      14.0   5    A
  *  *  *     *  *  *                              41.0   5    A
                          *  *  *     *  *  *      10.0   5    A

CLE=  80.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R   LTV  THV  RTV   PHF  LTFR THFR RTFR
    388  589    5  .850   456  693    6
      0  539   87  .850     0  634  102
      0    6    3  .850     0    7    4
     57    3  288  .890    64    3  324

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N   LU    v  Plt  Prt
  LT          456 1 1.00  456 1.00 0.00
  TH-RT       699 1 1.00  699 0.00 0.01
  TH-RT       736 1 1.00  736 0.00 0.14
  TH-RT        11 1 1.00   11 0.00 0.33
  LT-TH        67 1 1.00   67 0.95 0.00
  RT          324 1 1.00  324 0.00 1.00

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                 OPPOSING APPROACH
ING OPPOSED        VOLUMES        % OPPOSING LEFT TURN     # LANES      OPPOSING
                LT    TH   RT       LT    TH    RT        LT  TH  RT     VOLUME
STBOUND          0   634  102      100   100   100         0   1   0      736
UTHBOUND         0     7    4      100   100   100         0   1   0       11

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP  IDEAL N  Fwid   Fhv   Fgr  Fpark  Fbus  Farea   Frt   Flt     s
  LT         1800  1 0.967 0.990 1.000 1.000 1.000 1.000 1.000 0.950 1637
  TH-RT      1800  1 1.033 0.990 1.000 1.000 1.000 1.000 0.999 1.000 1839
  TH-RT      1800  1 1.100 0.990 1.000 1.000 1.000 1.000 0.881 1.000 1728
  TH-RT      1800  1 1.000 1.000 1.015 1.000 1.000 1.000 0.855 1.000 1562
  LT-TH      1800  1 1.100 0.995 1.000 1.000 1.000 1.000 1.000 1.000 1970
```

```
SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C    G   N    Va    Vm   Vlt   Plt  No    Vo Plto
SB  80   10   1    67   327    64 0.95   1    11 0.00
CALCULATIONS
DIR Sop     Yo      Gu     Fs     Pl      Gq     Pt      Gf          El     Fm    Flt
SB 1800 0.006  9.586 0.868 0.950  0.414 0.050  0.049      1.296 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP      v     s   v/s   g/C     c   v/c  CRITICAL
EB  LT          456 1637 0.15 0.18  551 0.83
EB  TH-RT       699 1839 0.38 0.75 1379 0.51
WB  TH-RT       736 1728 0.43 0.51  885 0.83       *
NB  TH-RT        11 1562 0.01 0.13  195 0.05
SB  LT-TH        67 1970 0.03 0.13  246 0.27
SB  RT          324 1675 0.19 0.36  607 0.53       *

CYCLE= 80.0  LOST=10.0  SUM V/S CRIT= 0.62 TOTAL V/C= 0.71
FOR THE EASTBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
 86 LEFT TURNS ON THE CHANGE INTERVAL AND  178 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP   v/c  g/C    C      d1     c       d2   PF    Delay LOS Avg Q  95% Q
EB  LT         0.83 0.75  80.0   5.02  551     7.11 1.00   12.13  B    8.4
EB  TH-RT      0.51 0.75  80.0   3.06 1379     0.26 0.40    1.33  A    3.9
WB  TH-RT      0.83 0.51  80.0  12.59  885     4.78 0.85   14.77  B    8.0
NB  TH-RT      0.05 0.13  80.0  23.43  195     0.00 0.85   19.92  C    0.2
SB  LT-TH      0.27 0.13  80.0  24.10  246     0.16 0.85   20.62  C    1.3
SB  RT         0.53 0.36  80.0  15.31  607     0.73 0.85   13.64  B    4.6

DIR Delay LOS
EB   5.60  B
WB  14.77  B
NB  19.92  C
SB  14.84  B
INTERSECTION DELAY = 10.18 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  28.7 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  16.1 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  55.0 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   3.8 secs green,   5.0 secs yellow + red clear
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
acon St./Chestnut St. & Rd.
 Peak Hour - Build Cond. with Improvements
te:03-01-1992                 time:13:20:31
ST DATA SET NAMES LOADED OR SAVED
LUME=bcbamm      GEOMETRICS=bcbamm      SIGNAL=bcbamm
CATED IN CBD:n
LUME & GEOMETRICS
       VOLUMES        # OF LANES      LANE WIDTH      CROSS
R  LT    TH    RT     LT TH RT      LT    TH    RT     WALK
  388   589     5      1  1  0    11.0 13.0   0.0       0
    0   530    77      0  1  0     0.0 15.0   0.0       0
    0     6     3      0  1  0     0.0 12.0   0.0       0
   59     3   289      0  1  1     0.0 15.0  15.0       0

AFFIC & ROADWAY CONDITIONS
                ADJ PARK                 PEDESTRIANS        ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
   0.0%  2.0%   N      0     0   .850    0   n      7.0    5
   0.0%  2.0%   N      0     0   .850    0   n      7.0    3
  -3.0%  0.0%   N      0     0   .850    0   n      7.0    3
   0.0%  1.0%   N      0     0   .890    0   n      7.0    3

ASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
   *  *  *                                   *      14.0   5    A
   *  *  *     *  *  *                              41.0   5    A
                           *  *  *     *  *  *      10.0   5    A

CLE=  80.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R   LTV   THV   RTV   PHF  LTFR THFR RTFR
    388   589     5  .850   456  693    6
      0   530    77  .850     0  624   91
      0     6     3  .850     0    7    4
     59     3   289  .890    66    3  325

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N   LU     v   Plt  Prt
  LT          456 1 1.00  456 1.00 0.00
  TH-RT       699 1 1.00  699 0.00 0.01
  TH-RT       714 1 1.00  714 0.00 0.13
  TH-RT        11 1 1.00   11 0.00 0.33
  LT-TH        70 1 1.00   70 0.95 0.00
  RT          325 1 1.00  325 0.00 1.00

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                   OPPOSING APPROACH
ING OPPOSED          VOLUMES          % OPPOSING LEFT TURN       # LANES       OPPOSING
                    LT    TH    RT          LT    TH    RT       LT   TH   RT     VOLUME
STBOUND              0   624    91         100   100   100        0    1    0      714
UTHBOUND             0     7     4         100   100   100        0    1    0       11

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt     s
  LT         1800  1 0.967 0.990 1.000 1.000 1.000 1.000 1.000 0.950 [illegible]
  TH-RT      1800  1 1.033 0.990 1.000 1.000 1.000 1.000 0.999 1.000 [illegible]
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NB   TH-RT        1800   1  1.000 1.000 1.015 1.000 1.000 1.000 0.855 1.000 1562
SB   LT-TH        1800   1  1.100 0.995 1.000 1.000 1.000 1.000 1.000 1.000 1970
SB   RT           1800   1  1.100 0.995 1.000 1.000 1.000 1.000 0.850 1.000 1675

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N    Va    Vm   Vlt   Plt No    Vo Plto
SB   80   10   1    70   328    66 0.95  1     11 0.00
CALCULATIONS
DIR Sop     Yo      Gu     Fs     Pl      Gq     Pt      Gf         El     Fm    Flt
SB 1800 0.006  9.586 0.868 0.952  0.414 0.048  0.047     1.296 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP      v     s   v/s  g/C     c   v/c  CRITICAL
EB   LT         456 1637 0.14 0.18  567 0.81
EB   TH-RT      699 1839 0.38 0.75 1379 0.51
WB   TH-RT      714 1731 0.41 0.51  887 0.81       *
NB   TH-RT       11 1562 0.01 0.13  195 0.05
SB   LT-TH       70 1970 0.04 0.13  246 0.28
SB   RT         325 1675 0.19 0.36  607 0.53       *

CYCLE= 80.0  LOST=10.0  SUM V/S CRIT= 0.61 TOTAL V/C= 0.69
FOR THE EASTBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
 86 LEFT TURNS ON THE CHANGE INTERVAL AND  194 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP   v/c  g/C   C      d1     c       d2   PF    Delay LOS Avg Q  95%
EB   LT        0.81 0.75 .80.0   4.80  567     5.81 1.00   10.61  B    8.4
EB   TH-RT     0.51 0.75  80.0   3.06 1379     0.26 0.40    1.33  A    3.9
WB   TH-RT     0.81 0.51  80.0  12.30  887     3.84 0.85   13.72  B    7.7
NB   TH-RT     0.05 0.13  80.0  23.43  195     0.00 0.85   19.92  C    0.2
SB   LT-TH     0.28 0.13  80.0  24.13  246     0.18 0.85   20.66  C    1.4
SB   RT        0.53 0.36  80.0  15.33  607     0.74 0.85   13.66  B    4.6

DIR Delay LOS
EB   5.00  A
WB  13.72  B
NB  19.92  C
SB  14.89  B
INTERSECTION DELAY =  9.52 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  27.7 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  16.5 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  54.4 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   4.1 secs green,   5.0 secs yellow + red clear
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
acon St./Chestnut St. & Rd.
 Peak Hour - Exist. Cond. with Improvements
te:03-02-1992                time:14:48:12
ST DATA SET NAMES LOADED OR SAVED
LUME=bcepmm     GEOMETRICS=bcepmm     SIGNAL=bcepmm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES      # OF LANES     LANE WIDTH     CROSS
R  LT   TH   RT     LT TH RT       LT   TH   RT    WALK
  298  495    4     1  1  0      11.0 13.0  0.0     0
    2  594   89     0  1  0       0.0 15.0  0.0     0
    4    1    5     0  1  0       0.0 12.0  0.0     0
   81    7  335     0  1  1       0.0 15.0 15.0     0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK              PEDESTRIANS        ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
  0.0%  1.0%   N     0     0   .850    0   n      7.0    5
  0.0%  2.0%   N     0     0   .890    0   n      7.0    3
 -3.0%  0.0%   N     0     0   .850    0   n      7.0    3
  0.0%  1.0%   N     0     0   .850    0   n      7.0    3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *  *  *                                  *      14.0   5    A
  *  *  *     *  *  *                             41.0   5    A
                          *  *  *     *  *  *     10.0   5    A

CLE=  80.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   298  495    4  .850   351  582    5
     2  594   89  .890     2  667  100
     4    1    5  .850     5    1    6
    81    7  335  .850    95    8  394

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N   LU    v  Plt  Prt
  LT          351 1 1.00  351 1.00 0.00
  TH-RT       587 1 1.00  587 0.00 0.01
  LT-TH-RT    770 1 1.00  770 0.00 0.13
  LT-TH-RT     12 1 1.00   12 0.40 0.50
  LT-TH       104 1 1.00  104 0.92 0.00
  RT          394 1 1.00  394 0.00 1.00

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                OPPOSING APPROACH
ING OPPOSED       VOLUMES      % OPPOSING LEFT TURN      # LANES     OPPOSING
               LT    TH    RT        LT    TH    RT       LT   TH   RT     VOLUME
STBOUND         2   667   100       100   100   100        0    1    0       767
STBOUND       351   582     5         0    68    68        1    1    0       401
RTHBOUND       95     8   394       100   100     0        0    1    1         8
UTHBOUND        5     1     6       100   100   100        0    1    0         7

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP   IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
  LT          1800  1 0.967 0.995 1.000 1.000 1.000 1.000 1.000 0.950 1645
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EB   TH-RT        1800  1 1.000 0.995 1.000 1.000 1.000 1.000 0.999 1.000 184
WB   LT-TH-RT     1800  1 1.100 0.990 1.000 1.000 1.000 1.000 0.882 1.000 1730
NB   LT-TH-RT     1800  1 1.000 1.000 1.015 1.000 1.000 1.000 0.833 1.000 1521
SB   LT-TH        1800  1 1.100 0.995 1.000 1.000 1.000 1.000 1.000 1.000 1970
SB   RT           1800  1 1.100 0.995 1.000 1.000 1.000 1.000 0.850 1.000 1675

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N    Va    Vm    Vlt  Plt No    Vo Plto
WB   80   41   1   770   767     2 0.00  1   401 0.00
NB   80   10   1    12     7     5 0.40  1     8 0.92
SB   80   10   1   104   402    95 0.92  1     7 0.40
CALCULATIONS
DIR Sop    Yo      Gu     Fs     Pl      Gq     Pt      Gf       El     Fm    Flt
WB 1800 0.223 29.816 0.624 0.003 11.184 0.997 11.077     1.802 1.000 1.000
NB 1418 0.006  9.591 0.870 0.400  0.409 0.600  0.297     1.293 1.000 1.000
SB 1362 0.005  9.635 0.871 0.920  0.365 0.080  0.064     1.292 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C    c  v/c  CRITICAL
EB   LT        351 1645 0.12 0.18  531 0.66
EB   TH-RT     587 1849 0.32 0.75 1386 0.42
WB   LT-TH-RT  770 1730 0.44 0.51  887 0.87      *
NB   LT-TH-RT   12 1521 0.01 0.13  190 0.06
SB   LT-TH     104 1970 0.05 0.13  246 0.42
SB   RT        394 1675 0.24 0.36  607 0.65      *

CYCLE= 80.0  LOST=10.0  SUM V/S CRIT= 0.68 TOTAL V/C= 0.78
FOR THE EASTBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
 87 LEFT TURNS ON THE CHANGE INTERVAL AND  156 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C     d1     c      d2   PF   Delay LOS Avg Q  95%
EB   LT       0.66 0.75  80.0   3.76   531     2.12 1.00    5.89  B    6.4
EB   TH-RT    0.42 0.75  80.0   2.78  1386     0.13 0.40    1.17  A    3.3
WB   LT-TH-RT 0.87 0.51  80.0  13.02   887     6.51 0.85   16.60  C    8.3
NB   LT-TH-RT 0.06 0.13  80.0  23.46   190     0.00 0.85   19.94  C    0.2
SB   LT-TH    0.42 0.13  80.0  24.57   246     0.71 0.85   21.48  C    2.0
SB   RT       0.65 0.36  80.0  16.16   607     1.72 0.85   15.20  C    5.6

DIR Delay LOS
EB   2.93  A
WB  16.60  C
NB  19.94  C
SB  16.50  C
INTERSECTION DELAY = 10.81 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  35.2 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  15.6 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  52.3 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   7.1 secs green,   5.0 secs yellow + red clear
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
acon St./Chestnut St. & Rd.
 Peak Hour - No-Build Cond. with Improvements
te:03-01-1992              time:13:16:15
ST DATA SET NAMES LOADED OR SAVED
LUME=bcnbpmm    GEOMETRICS=bcnbpmm    SIGNAL=bcnbomm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES      # OF LANES     LANE WIDTH     CROSS
R  LT   TH   RT    LT TH RT      LT   TH   RT    WALK
  317  532    4     1  1  0    11.0 13.0  0.0     0
    2  627   95     0  1  0     0.0 15.0  0.0     0
    4    1    5     0  1  0     0.0 12.0  0.0     0
   84    7  385     0  1  1     0.0 15.0 15.0     0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK             PEDESTRIANS        ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
  0.0%  1.0%   N     0    0   .850    0   n     7.0    5
  0.0%  2.0%   N     0    0   .890    0   n     7.0    3
 -3.0%  0.0%   N     0    0   .850    0   n     7.0    3
  0.0%  1.0%   N     0    0   .850    0   n     7.0    3

ASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *  *  *                                   *     14.0   5    A
  *  *  *     *  *  *                            41.0   5    A
                          *  *  *     *  *  *     10.0   5    A

CLE=  80.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   317  532    4  .850   373  626    5
     2  627   95  .890     2  704  107
     4    1    5  .850     5    1    6
    84    7  385  .850    99    8  453

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP  FLOW N   LU     v  Plt  Prt
  LT          373 1 1.00  373 1.00 0.00
  TH-RT       631 1 1.00  631 0.00 0.01
  LT-TH-RT    813 1 1.00  813 0.00 0.13
  LT-TH-RT     12 1 1.00   12 0.40 0.50
  LT-TH       107 1 1.00  107 0.92 0.00
  RT          453 1 1.00  453 0.00 1.00

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                OPPOSING APPROACH
ING OPPOSED       VOLUMES      % OPPOSING LEFT-TURN    # LANES     OPPOSING
               LT   TH   RT         LT   TH   RT        LT  TH  RT     VOLUME
STBOUND         2  704  107        100  100  100        0   1   0      811
STBOUND       373  626    5          0   68   68        1   1   0      431
RTHBOUND       99    8  453        100  100    0        0   1   1        8
UTHBOUND        5    1    6        100  100  100        0   1   0        7

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
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EB   TH-RT       1800  1 1.033 0.995 1.000 1.000 1.000 1.000 0.999 1.000 1849
WB   LT-TH-RT    1800  1 1.100 0.990 1.000 1.000 1.000 1.000 0.882 1.000 1730
NB   LT-TH-RT    1800  1 1.000 1.000 1.015 1.000 1.000 1.000 0.833 1.000 1521
SB   LT-TH       1800  1 1.100 0.995 1.000 1.000 1.000 1.000 1.000 1.000 1970
SB   RT          1800  1 1.100 0.995 1.000 1.000 1.000 1.000 0.850 1.000 1675

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N    Va    Vm   Vlt   Plt No    Vo Plto
WB   80   41   1   813   811     2 0.00  1   431 0.00
NB   80   10   1    12     7     5 0.40  1     8 0.92
SB   80   10   1   107   461    99 0.92  1     7 0.40
CALCULATIONS
DIR Sop     Yo       Gu      Fs      Pl      Gq      Pt      Gf          El      Fm    Flt
WB 1800 0.239 28.725 0.606 0.003 12.275 0.997 12.154       1.857 1.000 1.000
NB 1418 0.006  9.591 0.870 0.400  0.409 0.600  0.298       1.293 1.000 1.000
SB 1317 0.005  9.623 0.871 0.923  0.377 0.077  0.064       1.292 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP      v     s   v/s   g/C     c   v/c   CRITICAL
EB   LT         373 1645 0.13 0.18   501 0.74
EB   TH-RT      631 1849 0.34 0.75 1387 0.45
WB   LT-TH-RT   813 1730 0.47 0.51   886 0.92      *
NB   LT-TH-RT    12 1521 0.01 0.13   190 0.06
SB   LT-TH      107 1970 0.05 0.13   246 0.43
SB   RT         453 1675 0.27 0.36   607 0.75      *

CYCLE= 80.0  LOST=10.0  SUM V/S CRIT= 0.74 TOTAL V/C= 0.85
FOR THE EASTBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
 87 LEFT TURNS ON THE CHANGE INTERVAL AND  127 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c      d2    PF   Delay LOS Avg Q  95%
EB   LT        0.74 0.75  80.    4.30  501    4.10 1.00    8.40  B    6.8
EB   TH-RT     0.45 0.75  80.    2.88 1387    0.17 0.40    1.22  A    3.5
WB   LT-TH-RT 0.92 0.51  80.0  13.64  886   10.27 0.85   20.32  C    9.0
NB   LT-TH-RT 0.06 0.13  80.0  23.46  190    0.00 0.85   19.94  C    0.2
SB   LT-TH     0.43 0.13  80.0  24.61  246    0.80 0.85   21.60  C    2.1
SB   RT        0.75 0.36  80.0  16.94  607    3.48 0.85   17.36  C    6.4

DIR Delay LOS
EB   3.89  A
WB  20.32  C
NB  19.94  C
SB  18.17  C
INTERSECTION DELAY = 12.91  INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90  TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  45.4 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  17.1 secs green,   5.0 secs yellow + red clear
suggested timing phase 2 is  50.8 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   7.1 secs green,   5.0 secs yellow + red clear
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NCH PROGRAM VERSION DATE 4-29-1988
85 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
acon St./Chestnut St. & Rd.
 Peak Hour - Build Cond. with Improvements
te:03-01-1992              time:13:12:41
ST DATA SET NAMES LOADED OR SAVED
LUME=bcbpmm     GEOMETRICS=bcbpmm     SIGNAL=bcbpmm
CATED IN CBD:n
LUME & GEOMETRICS
      VOLUMES         # OF LANES      LANE WIDTH      CROSS
R  LT    TH    RT     LT TH RT       LT    TH    RT    WALK
  371   532     4      1  1  0     11.0  13.0   0.0     0
    2   631   110      0  1  0      0.0  15.0   0.0     0
    4     1     5      0  1  0      0.0  12.0   0.0     0
   76     7   407      0  1  1      0.0  15.0  15.0     0

AFFIC & ROADWAY CONDITIONS
               ADJ PARK                PEDESTRIANS           ARR
R GRADE %HV    Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
  0.0%  1.0%    N     0     0   .850    0    n     7.0     5
  0.0%  2.0%    N     0     0   .890    0    n     7.0     3
 -3.0%  0.0%    N     0     0   .850    0    n     7.0     3
  0.0%  1.0%    N     0     0   .850    0    n     7.0     3

ASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *  *  *                                   *       14.0   5    A
  *  *  *     *  *  *                               41.0   5    A
                          *  *  *     *  *  *       10.0   5    A

CLE=  80.0

LUME ADJUSTMENT WORKSHEET
RT 1 (MOVEMENT ADJUSTMENTS)
R  LTV  THV  RTV   PHF  LTFR THFR RTFR
   371  532    4  .850   436  626    5
     2  631  110  .890     2  709  124
     4    1    5  .850     5    1    6
    76    7  407  .850    89    8  479

RT 2 (LANE GROUP ADJUSTMENTS)
R LN GROUP   FLOW N   LU     v  Plt  Prt
  LT          436 1 1.00   436 1.00 0.00
  TH-RT       631 1 1.00   631 0.00 0.01
  LT-TH-RT    835 1 1.00   835 0.00 0.15
  LT-TH-RT     12 1 1.00    12 0.40 0.50
  LT-TH        98 1 1.00    98 0.92 0.00
  RT          479 1 1.00   479 0.00 1.00

RT 3 (OPPOSING VOLUME ADJUSTMENTS)
FT TURN                 OPPOSING APPROACH
ING OPPOSED        VOLUMES       % OPPOSING LEFT TURN      # LANES      OPPOSING
               LT    TH    RT       LT    TH    RT       LT   TH   RT
STBOUND         2   709   124      100   100   100        0    1    0
STBOUND       436   626     5        0    68    68        1    1    0
RTHBOUND       89     8   479      100   100     0        0    1    1
UTHBOUND        5     1     6      100   100   100        0    1    0

TURATION FLOW ADJUSTMENT WORKSHEET
R LN GROUP   IDEAL N   Fwid    Fhv    Fgr Fpark  Fbus Farea   Frt   Flt
  LT          1800  1 0.967 0.995 1.000 1.000 1.000 1.000 1.000 0.950
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WB   LT-TH-RT   1800   1  1.100 0.990 1.000 1.000 1.000 1.000 0.880 1.000 1725
NB   LT-TH-RT   1800   1  1.000 1.000 1.015 1.000 1.000 1.000 0.833 1.000 1521
SB   LT-TH      1800   1  1.100 0.995 1.000 1.000 1.000 1.000 1.000 1.000 1970
SB   RT         1800   1  1.100 0.995 1.000 1.000 1.000 1.000 0.850 1.000 1675

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR   C    G   N    Va    Vm   Vlt   Plt  No    Vo Plto
WB   80   41   1   835   833     2 0.00  1   431 0.00
NB   80   10   1    12     7     5 0.40  1     8 0.92
SB   80   10   1    98   487    89 0.92  1     7 0.40
CALCULATIONS
DIR Sop     Yo      Gu      Fs     Pl      Gq     Pt      Gf          El     Fm    Flt
WB 1800 0.239 28.725 0.606 0.003 12.275 0.997 12.157     1.857 1.000 1.000
NB 1420 0.006  9.592 0.870 0.400  0.408 0.600  0.297     1.293 1.000 1.000
SB 1296 0.005  9.617 0.871 0.916  0.383 0.084  0.070     1.292 1.000 1.000

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP      v     s   v/s  g/C     c   v/c  CRITICAL
EB   LT         436 1645 0.16 0.18   487 0.90
EB   TH-RT      631 1849 0.34 0.75 1387 0.45
WB   LT-TH-RT   835 1725 0.48 0.51   884 0.94      *
NB   LT-TH-RT    12 1521 0.01 0.13   190 0.06
SB   LT-TH       98 1970 0.05 0.13   246 0.40
SB   RT         479 1675 0.29 0.36   607 0.79      *

CYCLE= 80.0  LOST=10.0  SUM V/S CRIT= 0.77 TOTAL V/C= 0.88
FOR THE EASTBOUND PROTECTED/PERMISSIVE LEFT TURN LANE THE CAPACITY, V/S AND
RATIOS HAVE ALL BEEN ADJUSTED TO REFLECT A CAPACITY FOR
 87 LEFT TURNS ON THE CHANGE INTERVAL AND  113 ON THE PERMISSIVE PHASE

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c      d2   PF    Delay LOS Avg Q  95% (
EB   LT        0.90 0.75  80.0   5.79   487   13.39 1.00   19.18  C    8.0
EB   TH-RT     0.45 0.75  80.0   2.88  1387    0.17 0.40    1.22  A    3.5
WB   LT-TH-RT 0.94 0.51  80.0  14.00   884   13.32 0.85   23.22  C    9.9
NB   LT-TH-RT 0.06 0.13  80.0  23.46   190    0.00 0.85   19.94  C    0.2
SB   LT-TH     0.40 0.13  80.0  24.49   246    0.57 0.85   21.30  C    1.9
SB   RT        0.79 0.36  80.0  17.30   607    4.79 0.85   18.78  C    6.8

DIR Delay LOS
EB   8.57   B
WB  23.22   C
NB  19.94   C
SB  19.21   C
INTERSECTION DELAY = 16.00 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF  90   TO  90 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS  90.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  52.7 SECONDS
for chosen cycle length  90.0
suggested timing phase 1 is  18.8 secs green,   5.0 secs yellow + red cle
suggested timing phase 2 is  50.3 secs green,   5.0 secs yellow + red clear
suggested timing phase 3 is   5.9 secs green,   5.0 secs yellow + red clear
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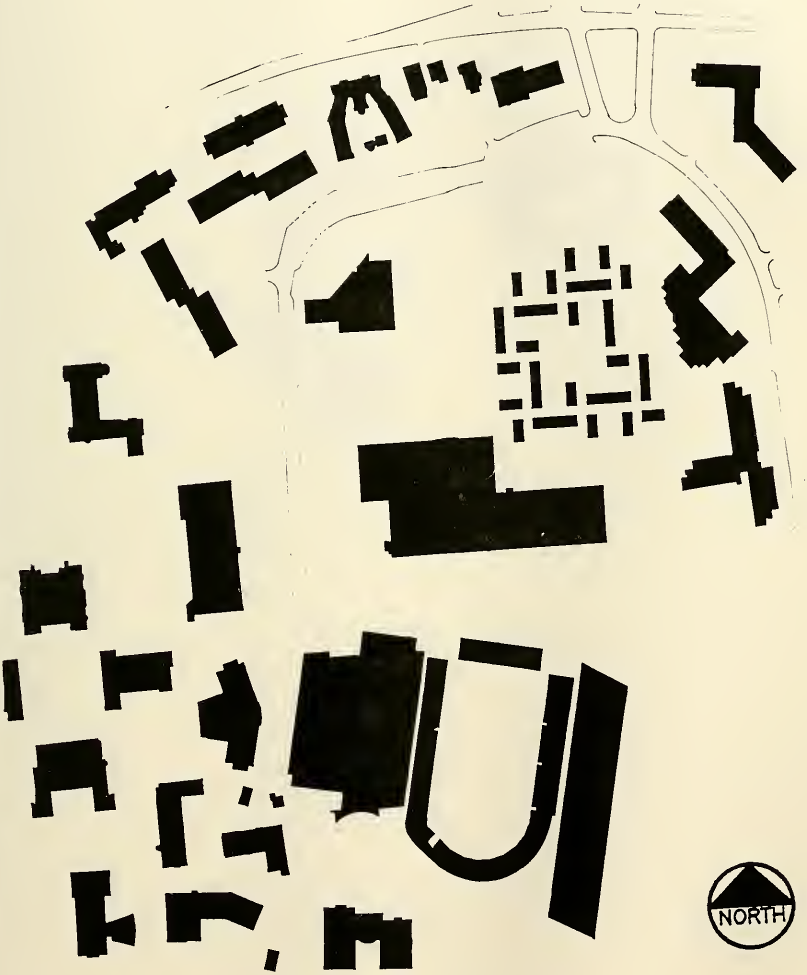

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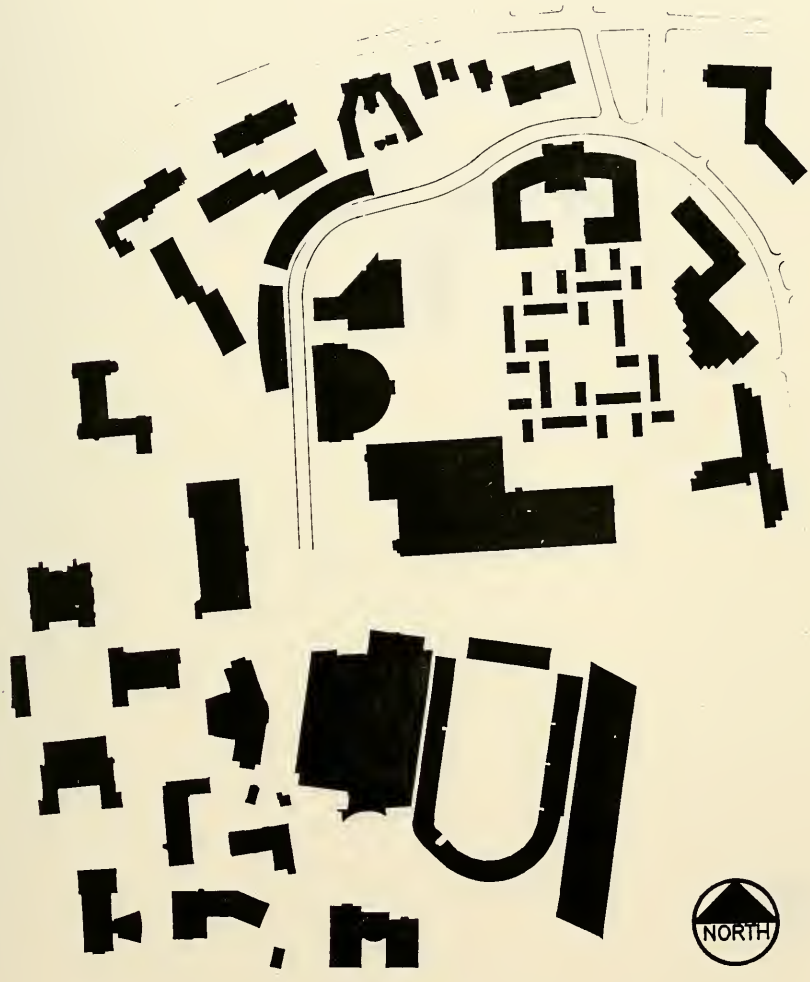

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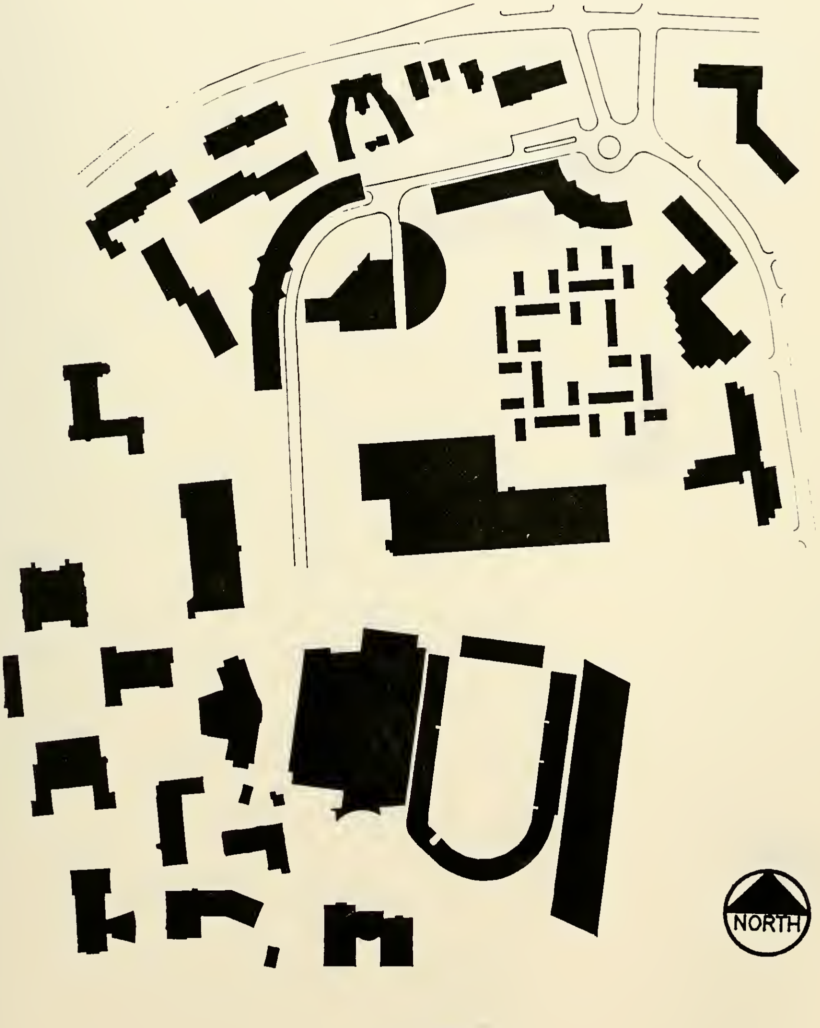

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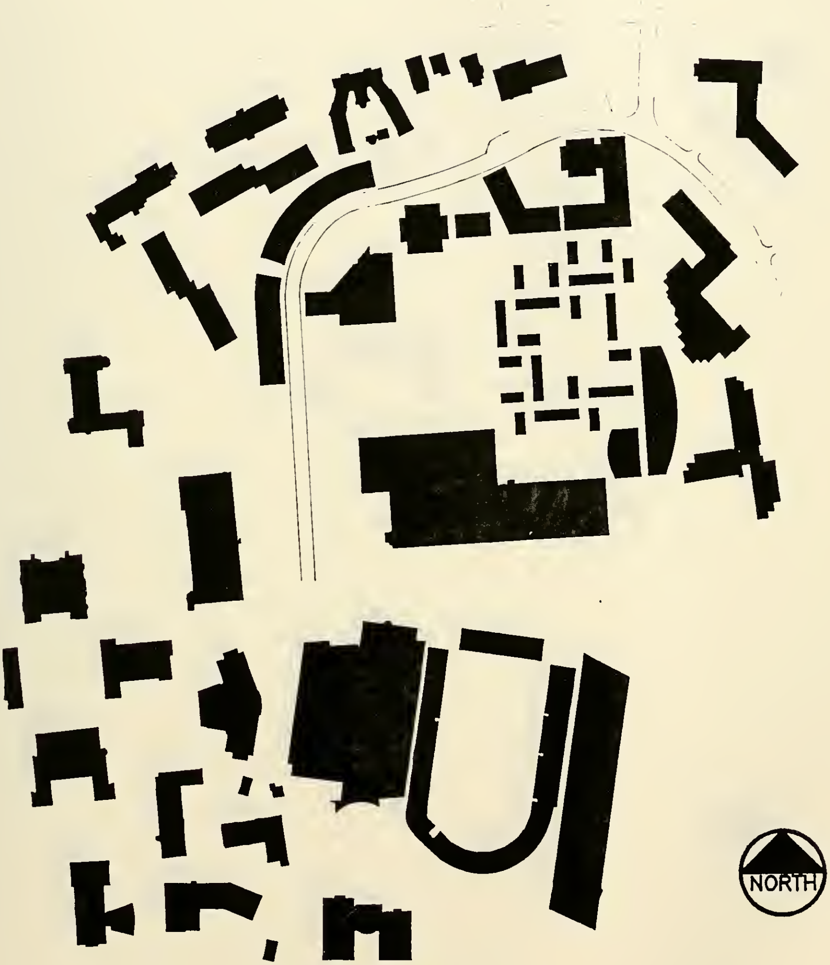

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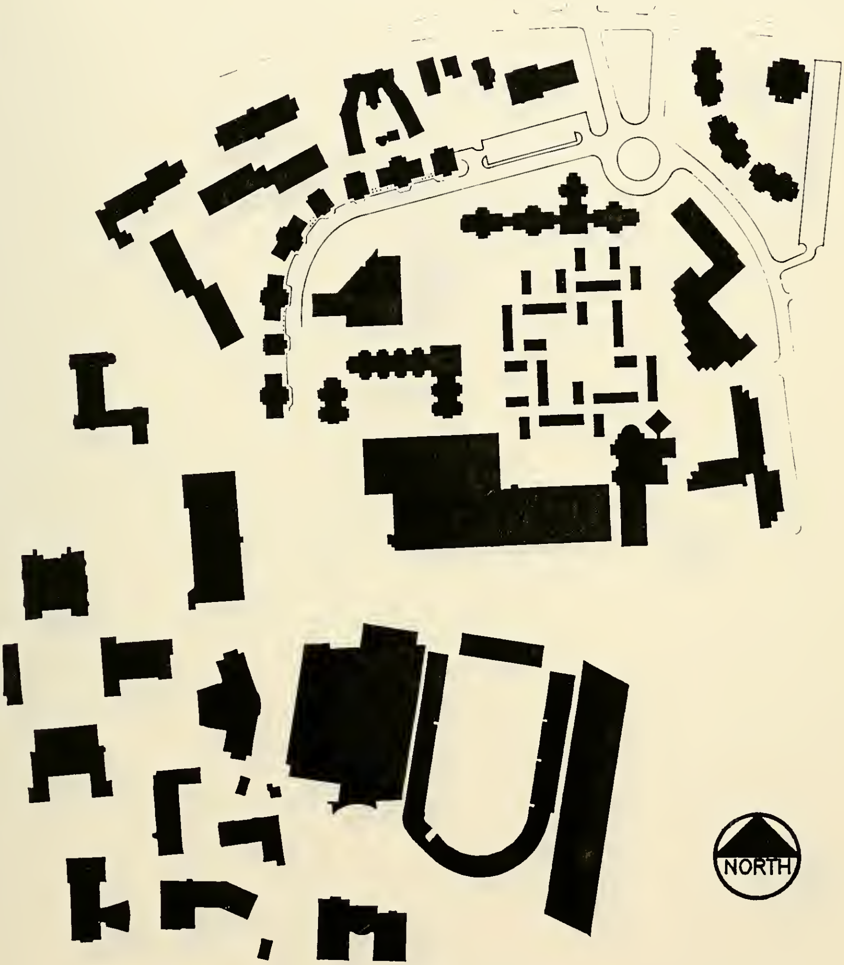

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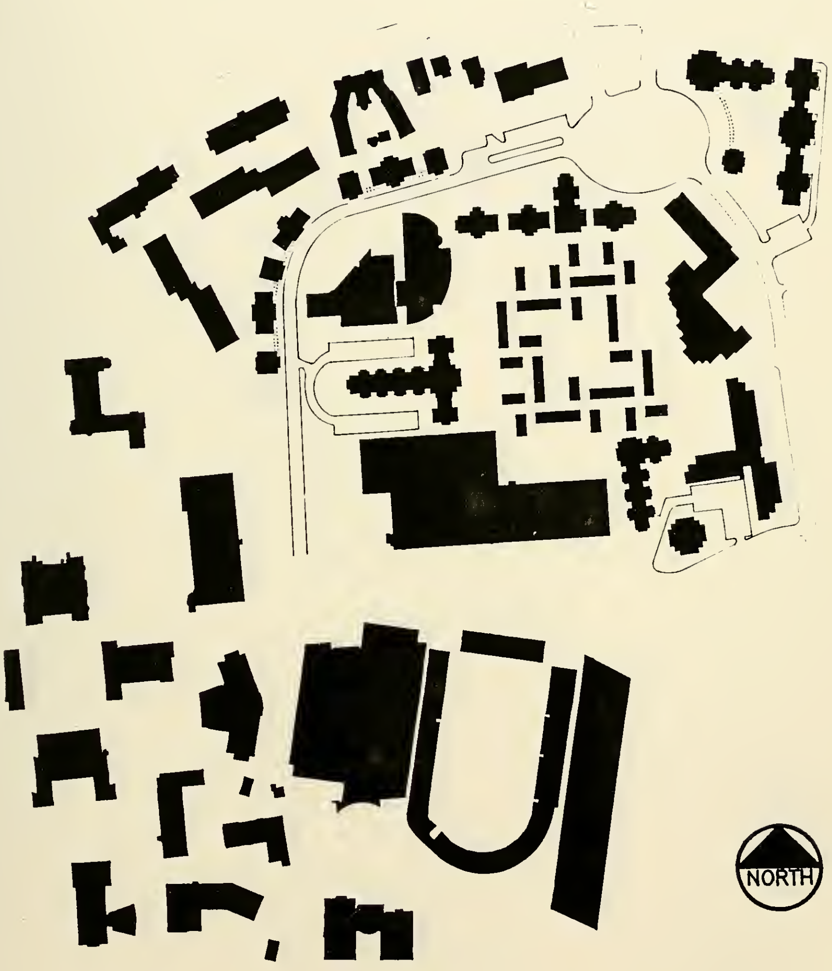

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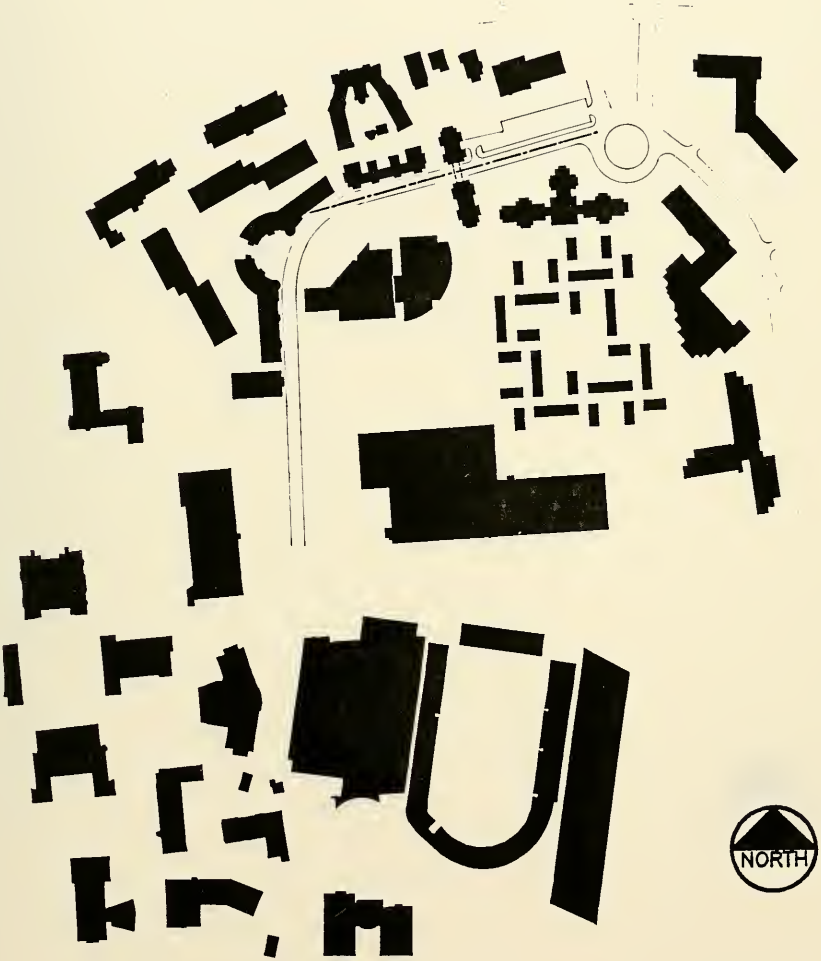

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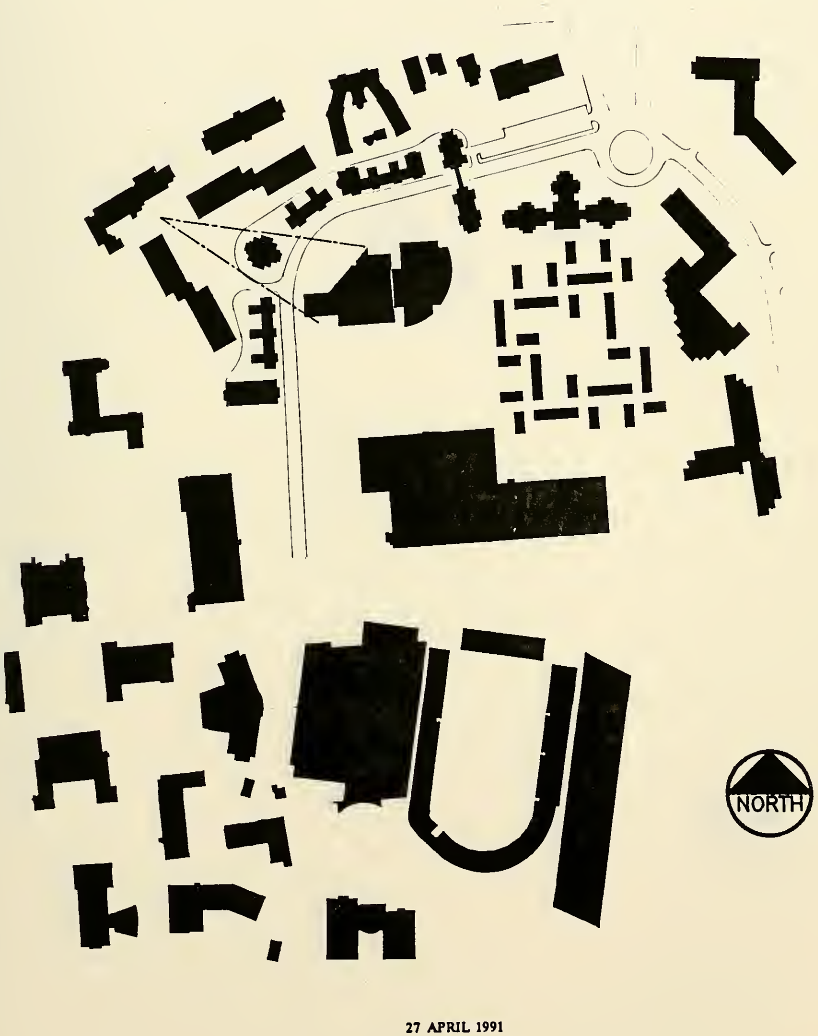

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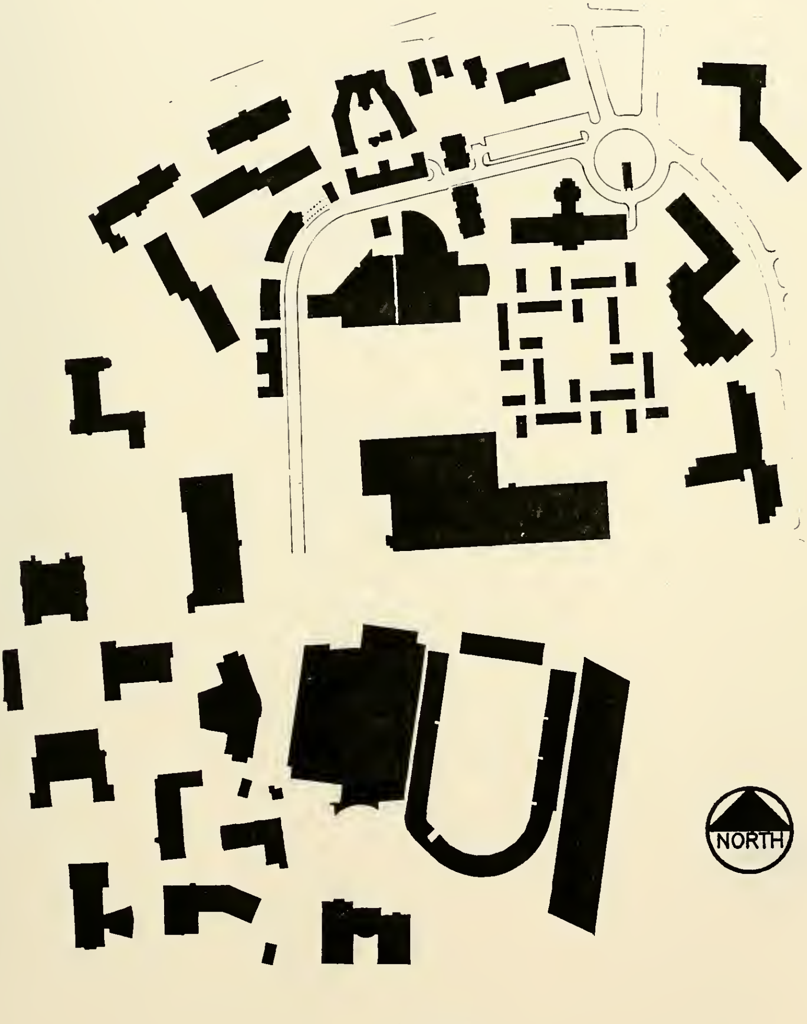

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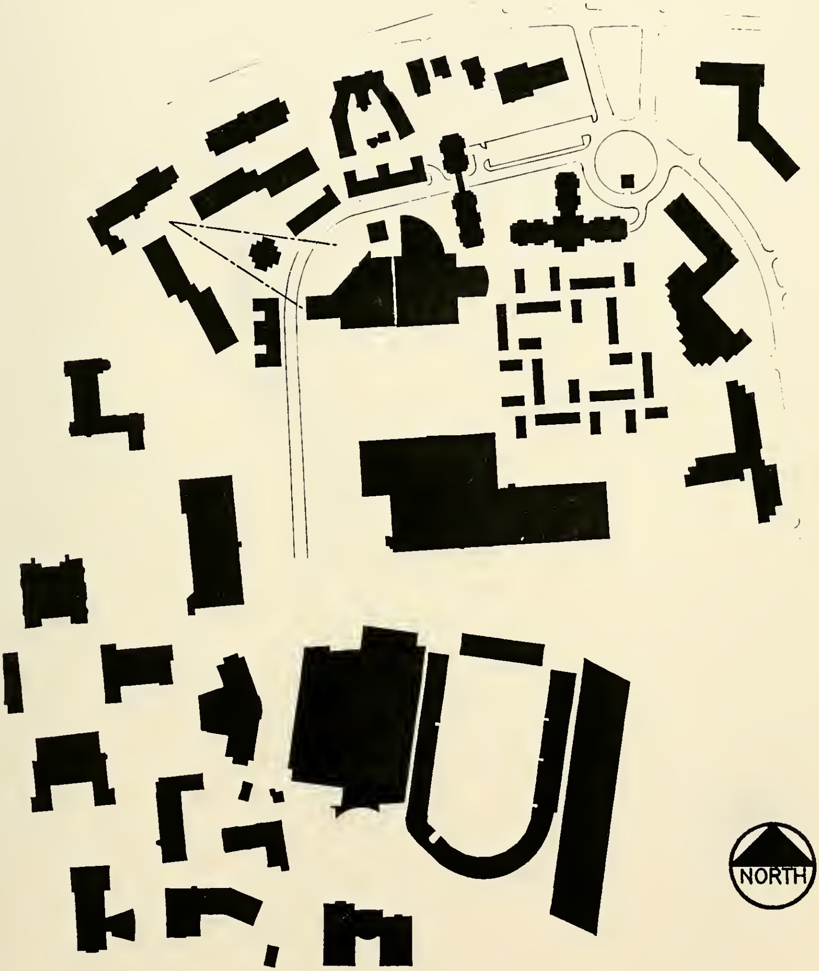

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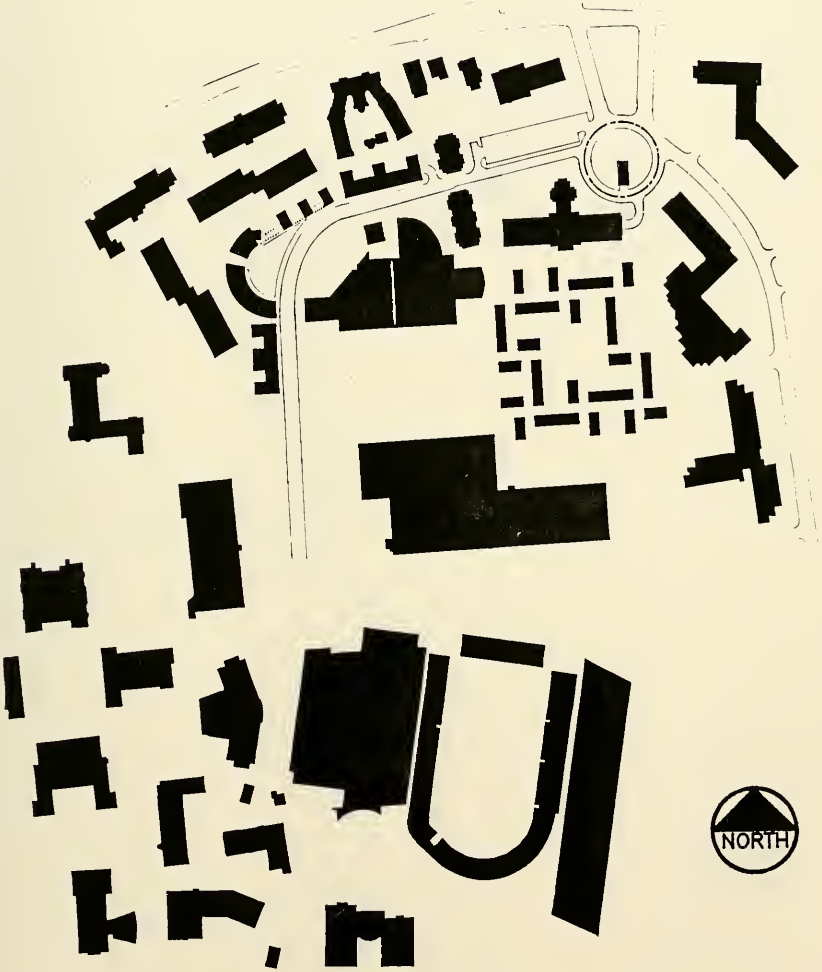

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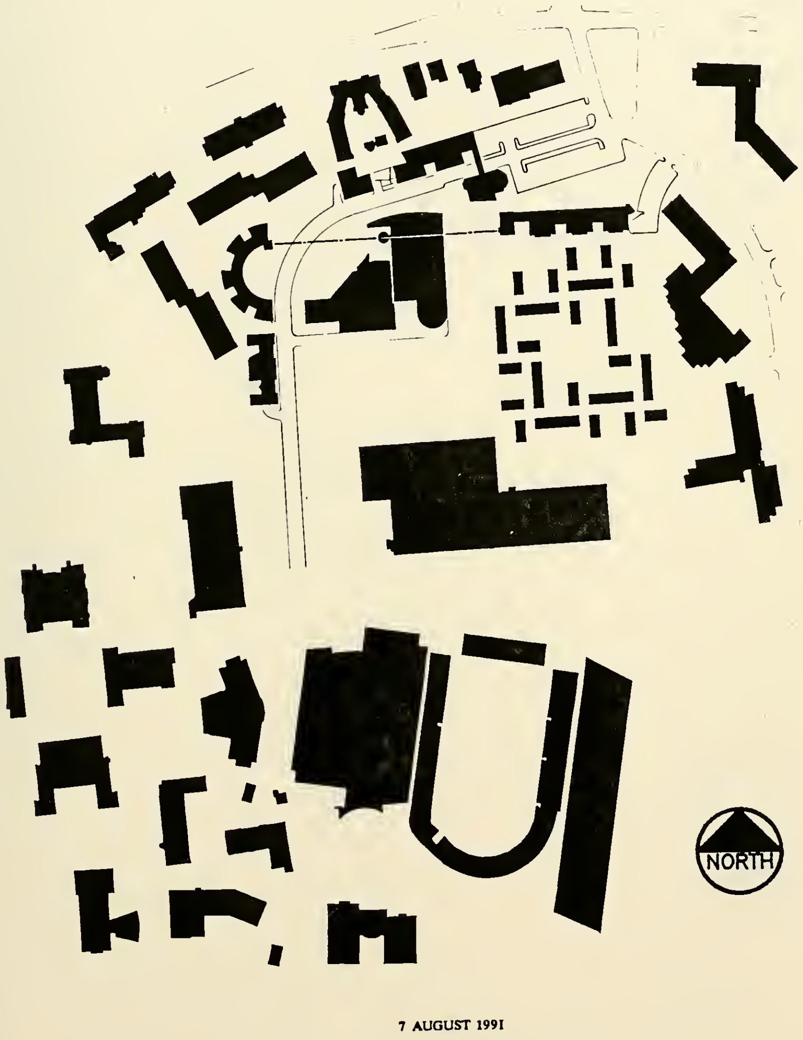

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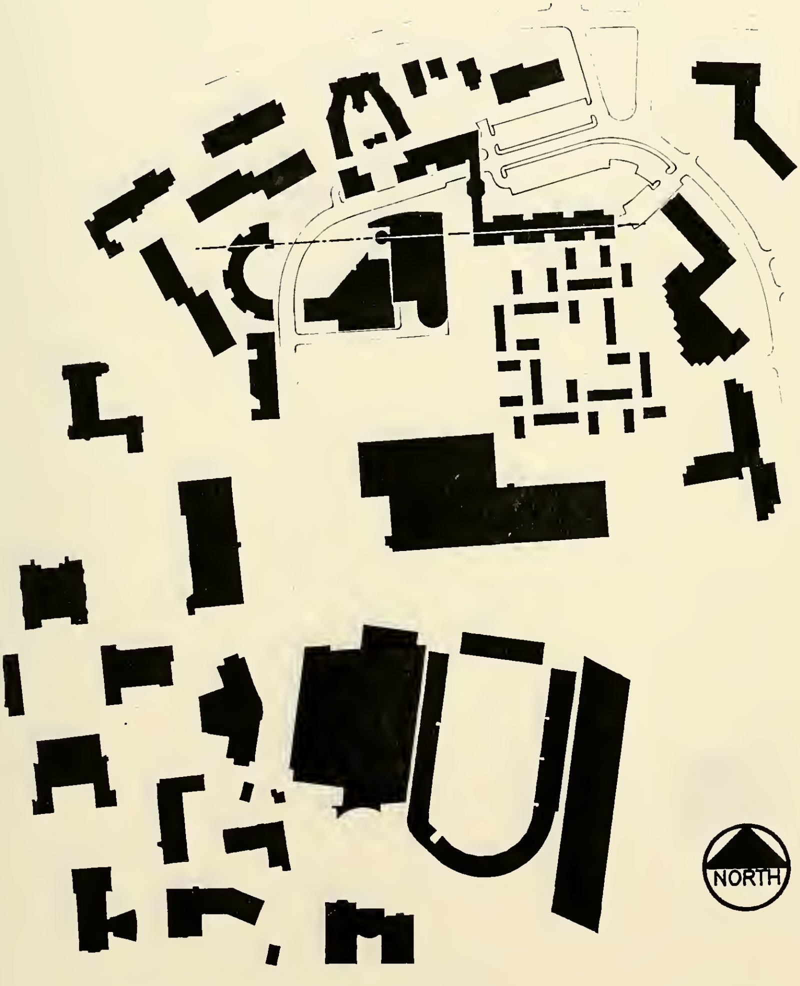

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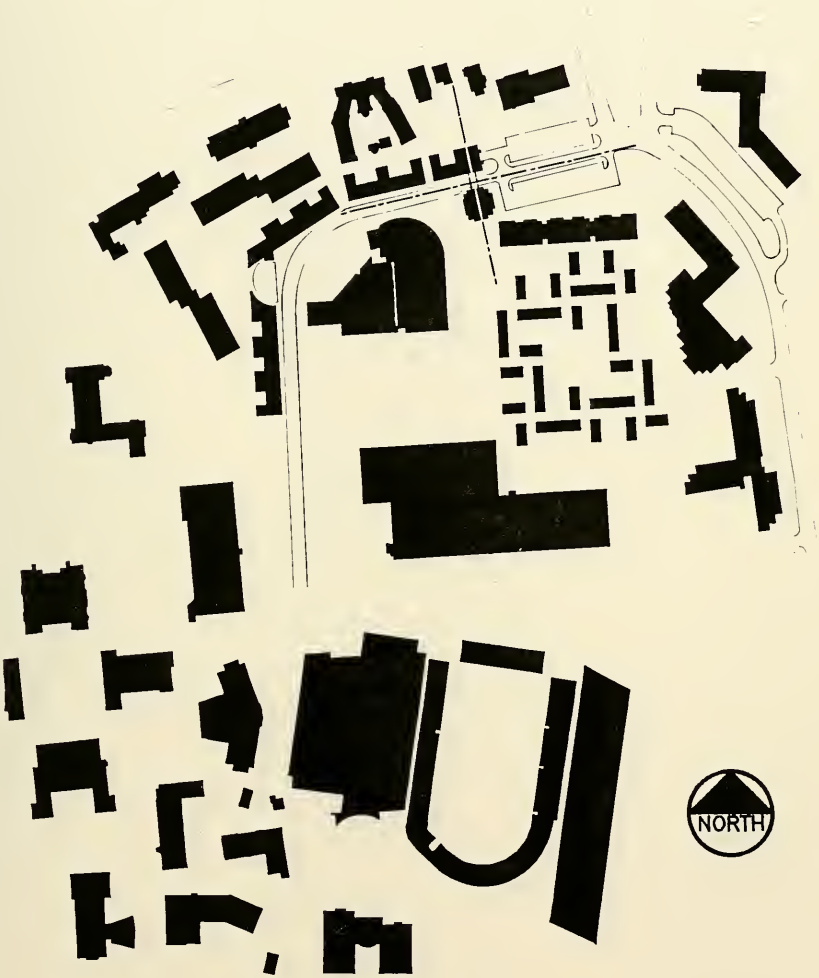

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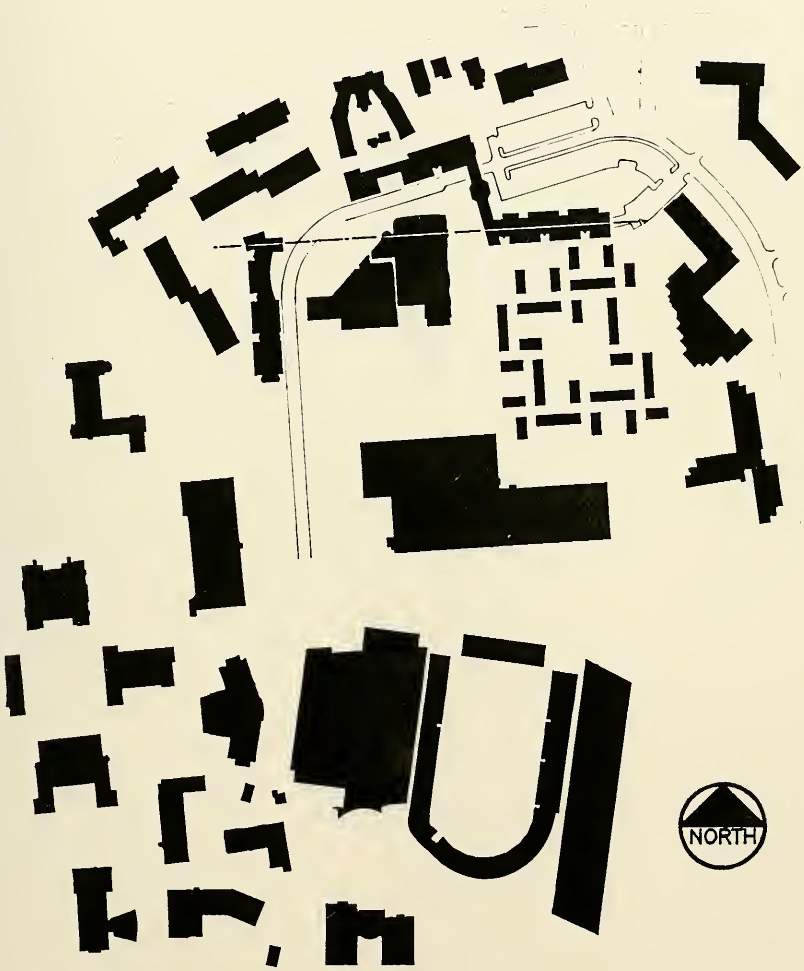

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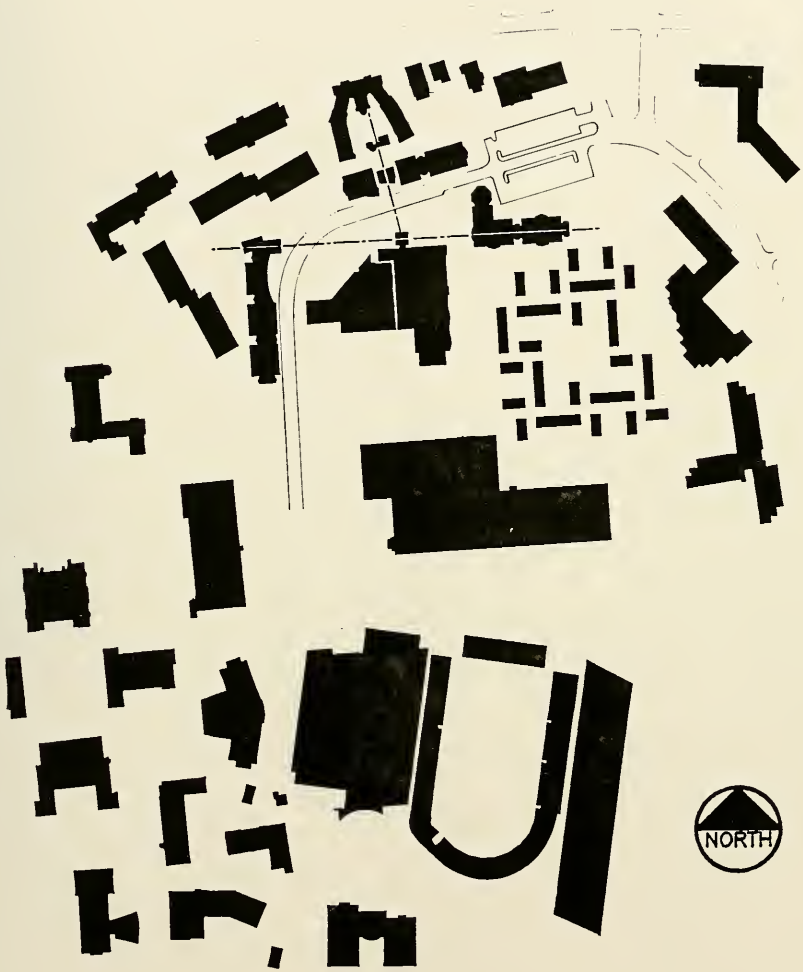

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